Science & Technology of NA-MIC

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Acknowledgments

National Alliance for Medical Image Computing

NIH U54EB005149

- The National Alliance for Medical Image Computing (**NA-MIC**) is a National Center for Biomedical Computing (**NCBC**) and part of the **NIH Roadmap Initiative**

Big Science

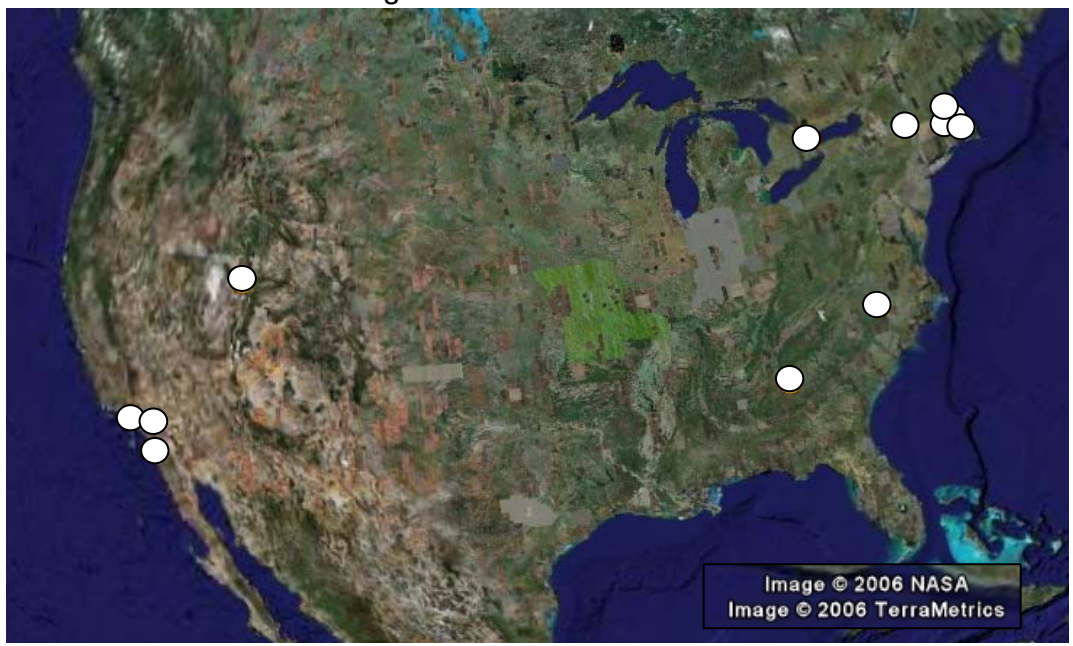
- Pros
  - “Big Science” done right is a force multiplier
  - Development and adoption of best practices
  - Faster and higher-quality dissemination of new techniques and of new science
- Cons
  - Re-education of scientist is necessary but difficult
  - Infrastructure is difficult to explain/justify: long lead times between creation and impact

NA-MIC Methodology

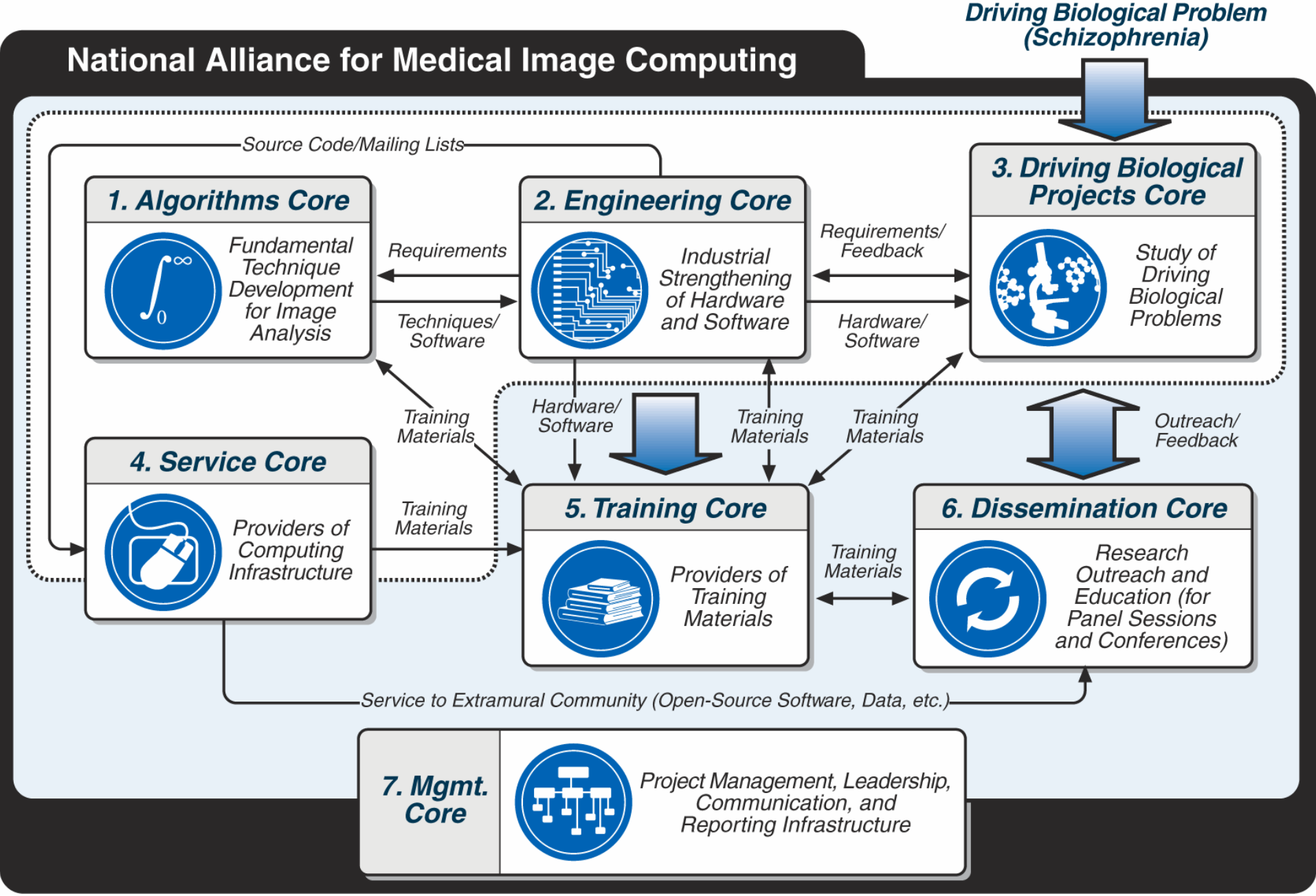
- A community of Tool Builders and Users of Tools
  - With a common vision;
  - With academic and commercial participants
  - With a multi-layered matrix organization
- A business model
- A software development approach
- A multi-site, multi-disciplinary communication model

NA-MIC Community

- Leadership:
  - BWH: Ron Kikinis, (Overall PI)
  - Steve Wong
- Core 1 Algorithms
  - Utah: Ross Whitaker (Core 1 PI)
  - MIT: Eric Grimson
  - UNC: Guido Gerig
  - MGH: Bruce Fischl, Dave Kennedy
  - GaTech: Allen Tannenbaum
- Core 2 Engineering
  - GE: Bill Lorensen (Core 2 PI)
  - Kitware: Will Schroeder
  - Isomics: Steve Pieper
  - UCSD: Mark Ellisman
  - UCLA: Art Toga
- Core 3 DBP
  - BWH: Martha Shenton
  - Dartmouth: Andy Saykin
  - UCI: Steve Potkin
  - UofT: Jim Kennedy
- Core 4 Service
  - Kitware: Will Schroeder
- Core 5 Training
  - MGH: Randy Gollub
- Core 6 Dissemination
  - Isomics: Steve Pieper, Tina Kapur
- Core 7 Management
  - BWH: Steve Wong



Provided by Pieper, Kikinis

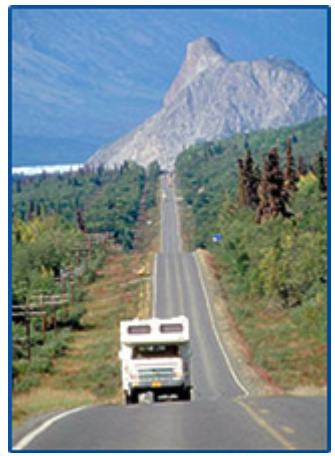

Driving Biological Problem (Schizophrenia)
National Alliance for Medical Image Computing
Source Code/Mailing Lists
1. Algorithms Core
Fundamental Technique Development for Image Analysis
2. Engineering Core
Industrial Strengthening of Hardware and Software
3. Driving Biological Projects Core
Study of Driving Biological Problems
Requirements
Techniques/ Software
Requirements/ Feedback
Hardware/ Software
Training Materials
Hardware/ Software
Training Materials
Training Materials
Outreach/ Feedback
4. Service Core
Providers of Computing Infrastructure
Training Materials
5. Training Core
Providers of Training Materials
Training Materials
6. Dissemination Core
Research Outreach and Education (for Panel Sessions and Conferences)
Service to Extramural Community (Open-Source Software, Data, etc.)
7. Mgmt. Core
Project Management, Leadership, Communication, and Reporting Infrastructure

NA-MIC Business Model

- NA-MIC technology is or will be
  - Tested and documented
  - Available on multiple platforms
  - Free, BSD style, opensource.org compliant
- Will empower scientists to do their own analysis using local or remote resources
- NA-MIC is aimed at
  - Biomedical Researchers
  - Software Developers

NA-MIC Kit – A Public Highway…

- NA-MIC, is like a Public Road System
  - Provides Infrastructure for a Variety of Uses
  - Driveways can Lead to Anything
    - a Public Park
    - a Proprietary Gated Community
    - a Factory
    - a Coop Grocery Store



Provided by Pieper, Kikinis

NA-MIC Kit

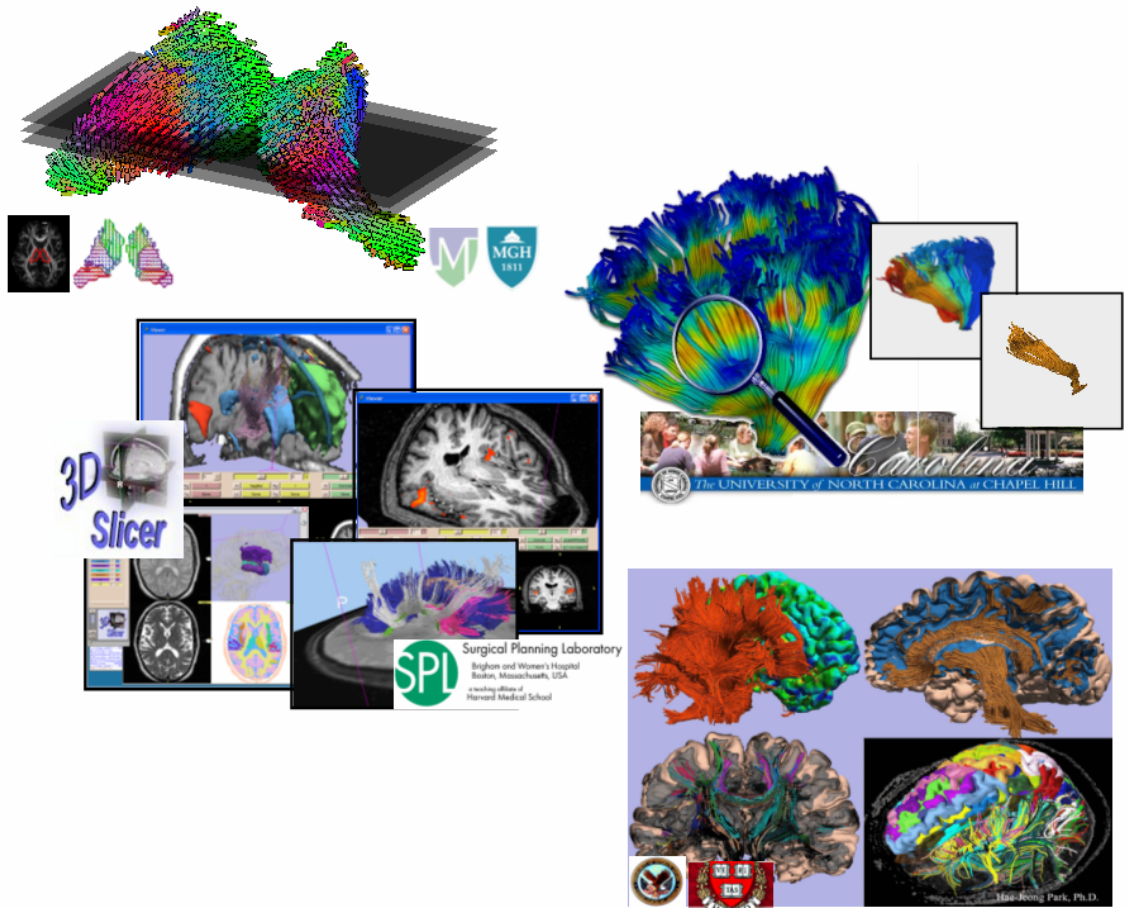
- The **NA-MIC Kit** is a Collection of Software and Methodologies for Medical Image Computing
- Most components of the NA-MIC kit predate the NCBC program

NA-MIC Kit

- Packaging of:
  - –Applications
  - –Algorithms (toolkits)
  - –Methodologies

NA-MIC Kit Functionality

- First Generation of Driving Biological Projects
  - Schizophrenia Research
- Quantify Structural and Functional Relationships to Disease and Symptoms
- Integrated Software Tools
  - Morphometric MRI, DTI, and fMRI
  - Segmentation and Registration
- NA-MIC Kit will evolve with collaborations and new DBPs in PGY 04: VCFS, Vascular Brain Disorders, Brain Development, Prostate Interventions



Provided by Pieper, Kikinis

NA-MIC Kit Components

- End User Application
  - 3D Slicer
- Image Analysis, Visualization, and GUI libraries
  - ITK, VTK, KWWidgets
- Large Scale Data Processing Tools
  - LONI Pipeline, GRID tools
- Software Engineering Tools
  - CMake, Dart, CTest, CPack

Provided by Pieper, Kikinis

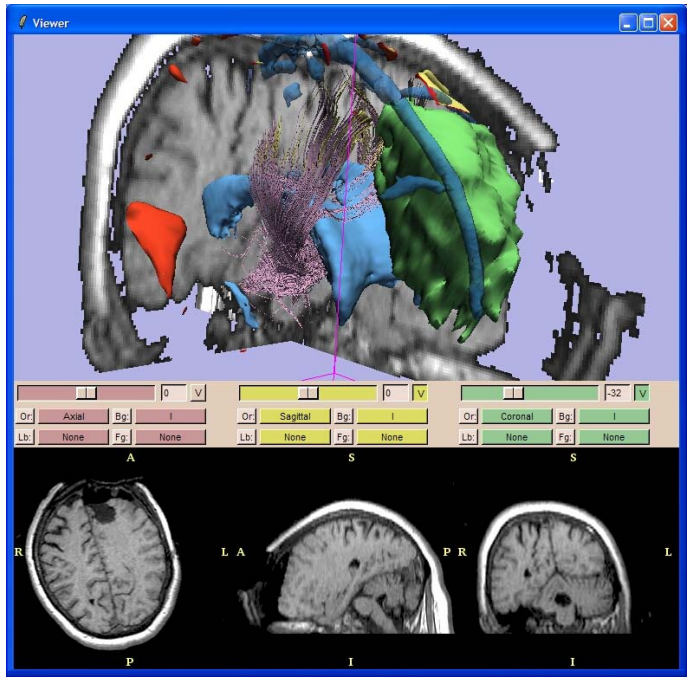
NA-MIC Kit

3DSlicer

Neuroimage Analysis Center
NIH P41RR013218

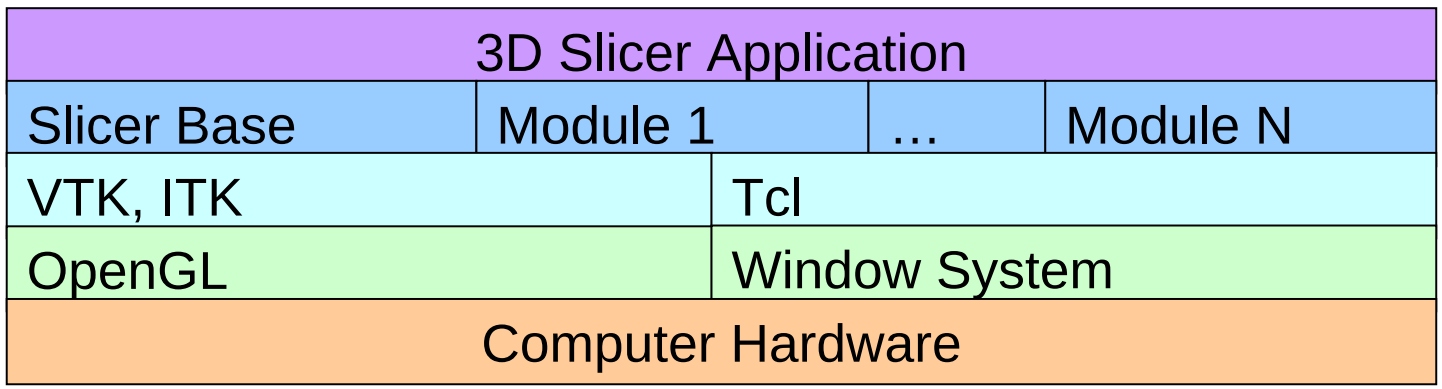
What is 3D Slicer?

- An end-user application for
  - Neuroscience
  - Image Guided Therapy
  - Other Applications
- A platform for exploring novel image analysis and visualization techniques
- A freely-downloadable program with source and binaries available for Windows, Linux, Solaris and Mac OSX
- NOT an FDA approved medical device
- NOT finished – some parts will work better than others



Architecture

- 500k+ lines of code in Slicer 2.6 rc4
- Plug-in Modules with cross-platform file layout for building and loading
- Slicer 3 alpha release planned for this summer. Upwards compatible.
  - New widgets, data model and execution model
  - Updating of other components



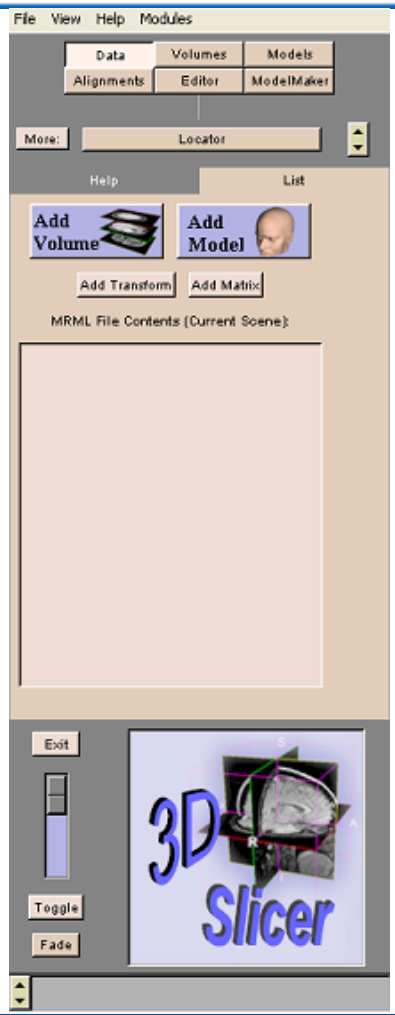
Slicer: Image Formats

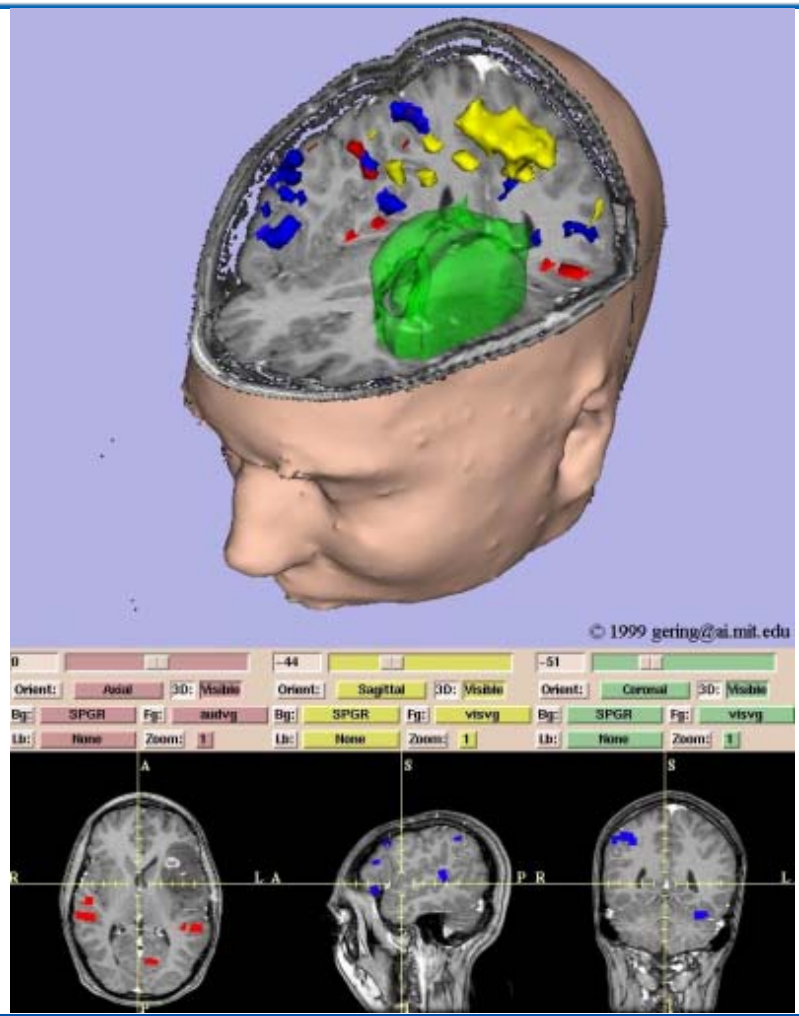
- Uses ITK IO factory
- DICOM, GE, Headerless, Analyze, NIFTI
  - Best Support for MR
  - CT and RGB Support limited
  - Analyze Sequence
  - BXH Files
    - BIAC XML Header (Brain Image Analysis Center, Duke)
    - Like MRML for fMRI; Integration Work Ongoing

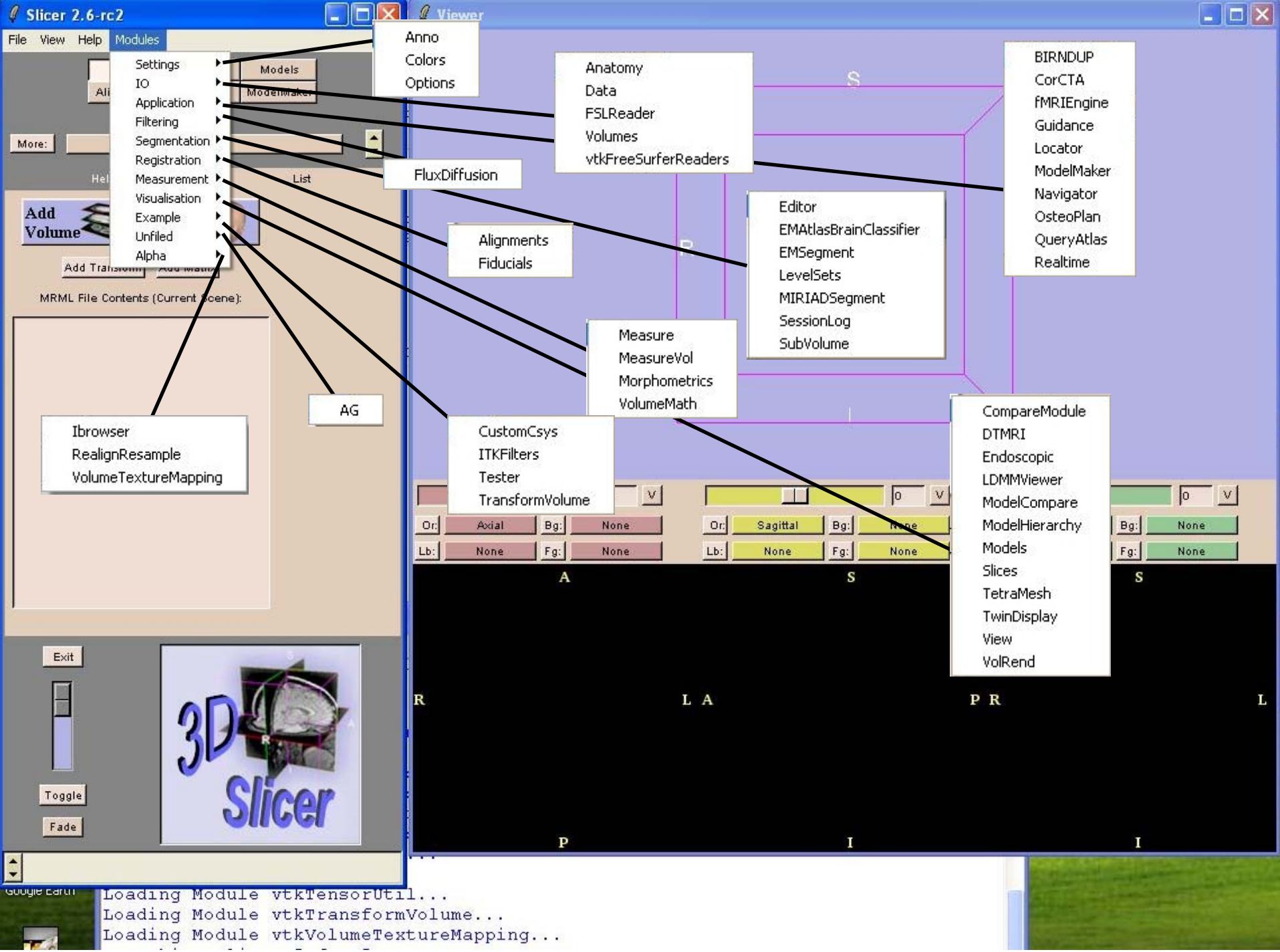
Slicer Overview

- Visualization
- Registration
- Segmentation
- 3d Surface Model Generation
- Quantification
- Real-time Integration

Welcome to 3D Slicer

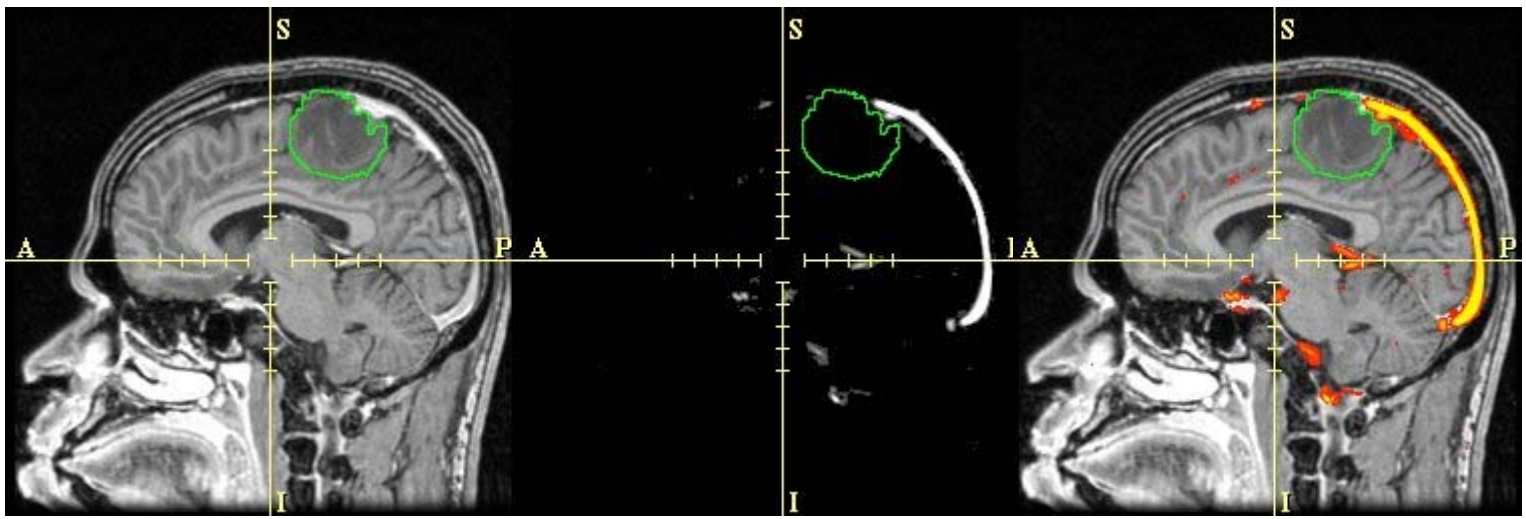





Slicer 2.6-rc2
File View Help Modules
Settings
IO
Application
Filtering
Segmentation
Registration
Measurement
Visualisation
Example
Unfiled
Alpha
Anno
Colors
Options
Anatomy
Data
FSLReader
Volumes
vtkFreeSurferReaders
FluxDiffusion
Alignments
Fiducials
Editor
EMAtlasBrainClassifier
EMSegment
LevelSets
MIRIADSegment
SessionLog
SubVolume
BIRNDUP
CorCTA
fMRIEngine
Guidance
Locator
ModelMaker
Navigator
OsteoPlan
QueryAtlas
Realtime
Measure
MeasureVol
Morphometrics
VolumeMath
AG
Ibrowser
RealignResample
VolumeTextureMapping
CustomCsys
ITKFilters
Tester
TransformVolume
CompareModule
DTMRI
Endoscopic
LDMMViewer
ModelCompare
ModelHierarchy
Models
Slices
TetraMesh
TwinDisplay
View
VolRend
Viewer
Add Volume
MRML File Contents (Current Scene):
Exit
Toggle
Fade
Loading Module vtkTensorUtil...
Loading Module vtkTransformVolume...
Loading Module vtkVolumeTextureMapping...

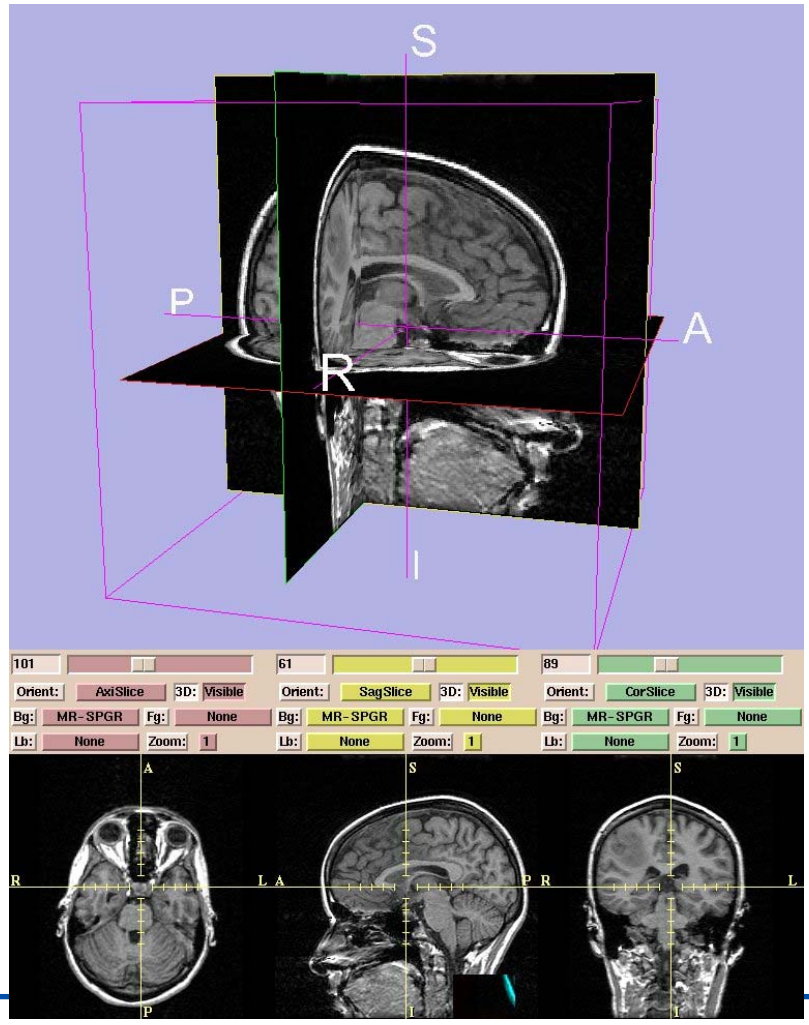
Display of Cross-Sections

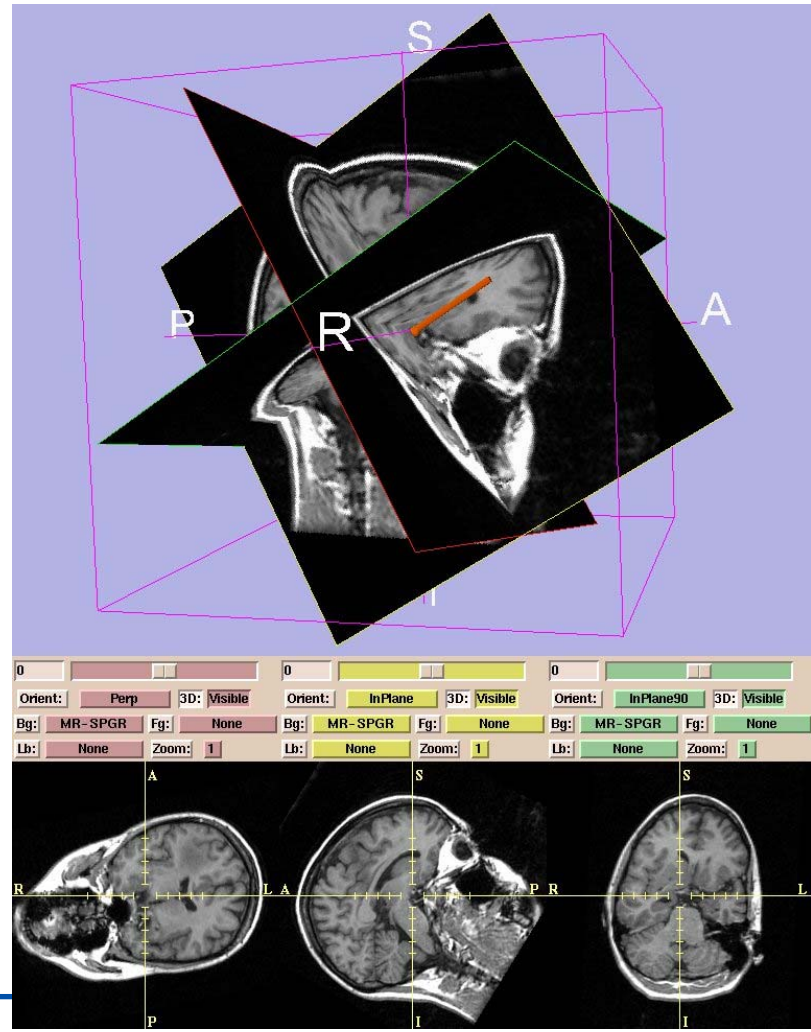
- Background (typically gray level)
- Foreground (typically color)
- Label (colored, outline of segmented structures)



SPGR Angio Angio on SPGR

Multi-Plane Reformat



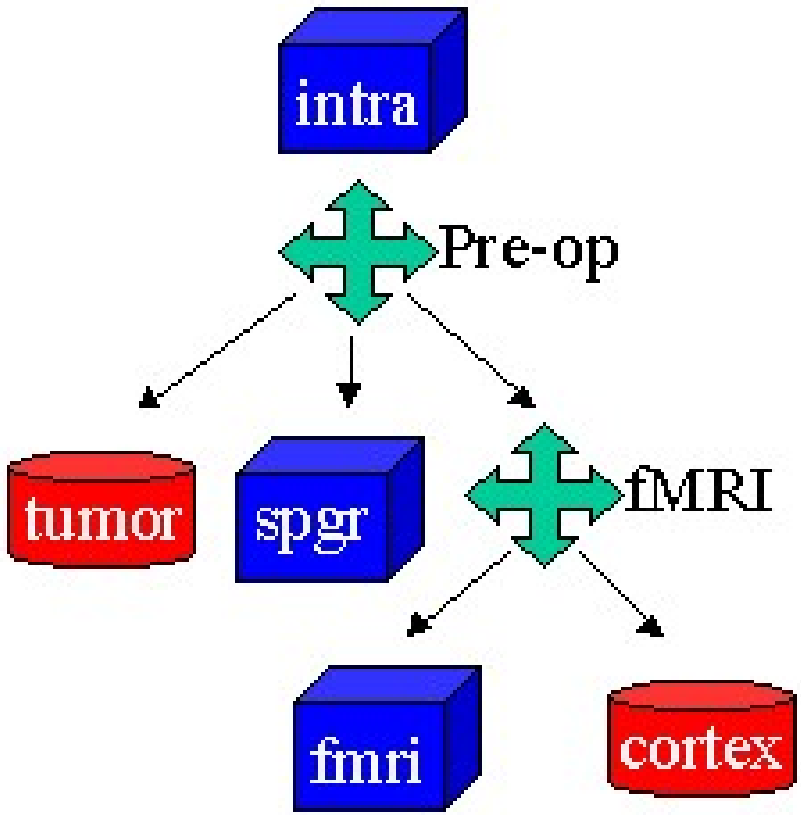


Scene Description

MRML File:

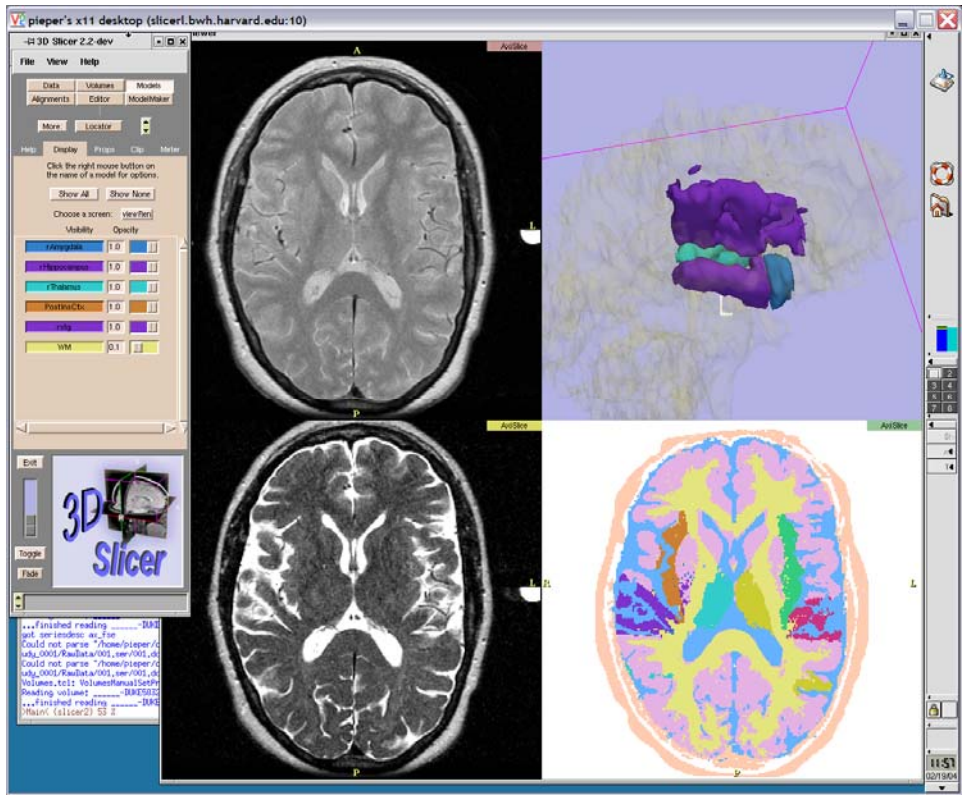
Volume:	intra
Transform:	Pre-op
Volume:	spgr
Model:	tumor
Transform:	fMRI
Volume:	fmri
Model:	cortex

MRML Tree:



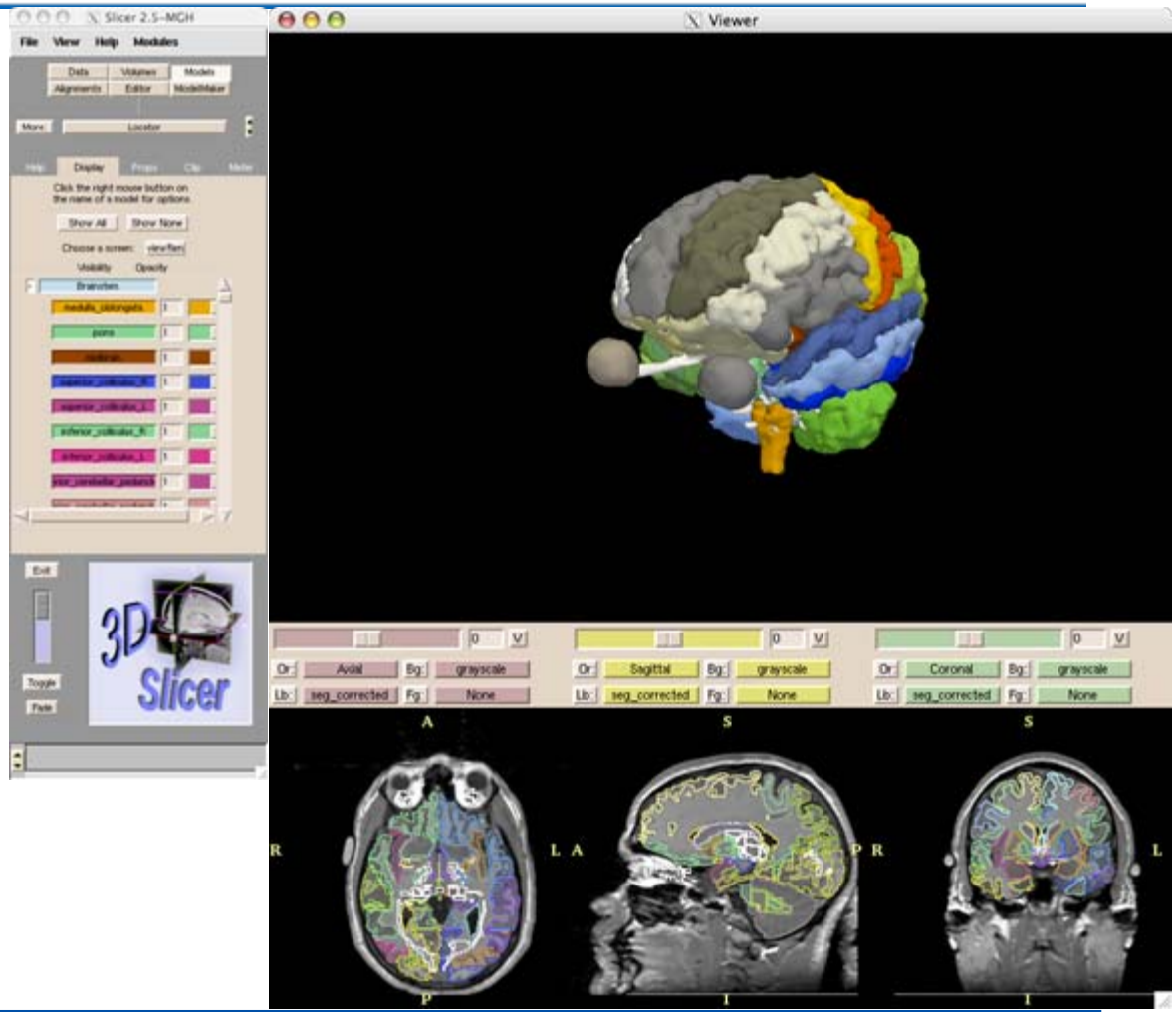
Image/Scene Management

- XML-Based MRML File Stores Scene Description
  - Volumes (Images, Label Maps)
  - Models
  - Hierarchical Affine Transforms
  - Scene Data (Cameras, Colors, Fiducials, etc).
- Manipulated in World Coordinates based on Patient RAS



SPL Brain Atlas

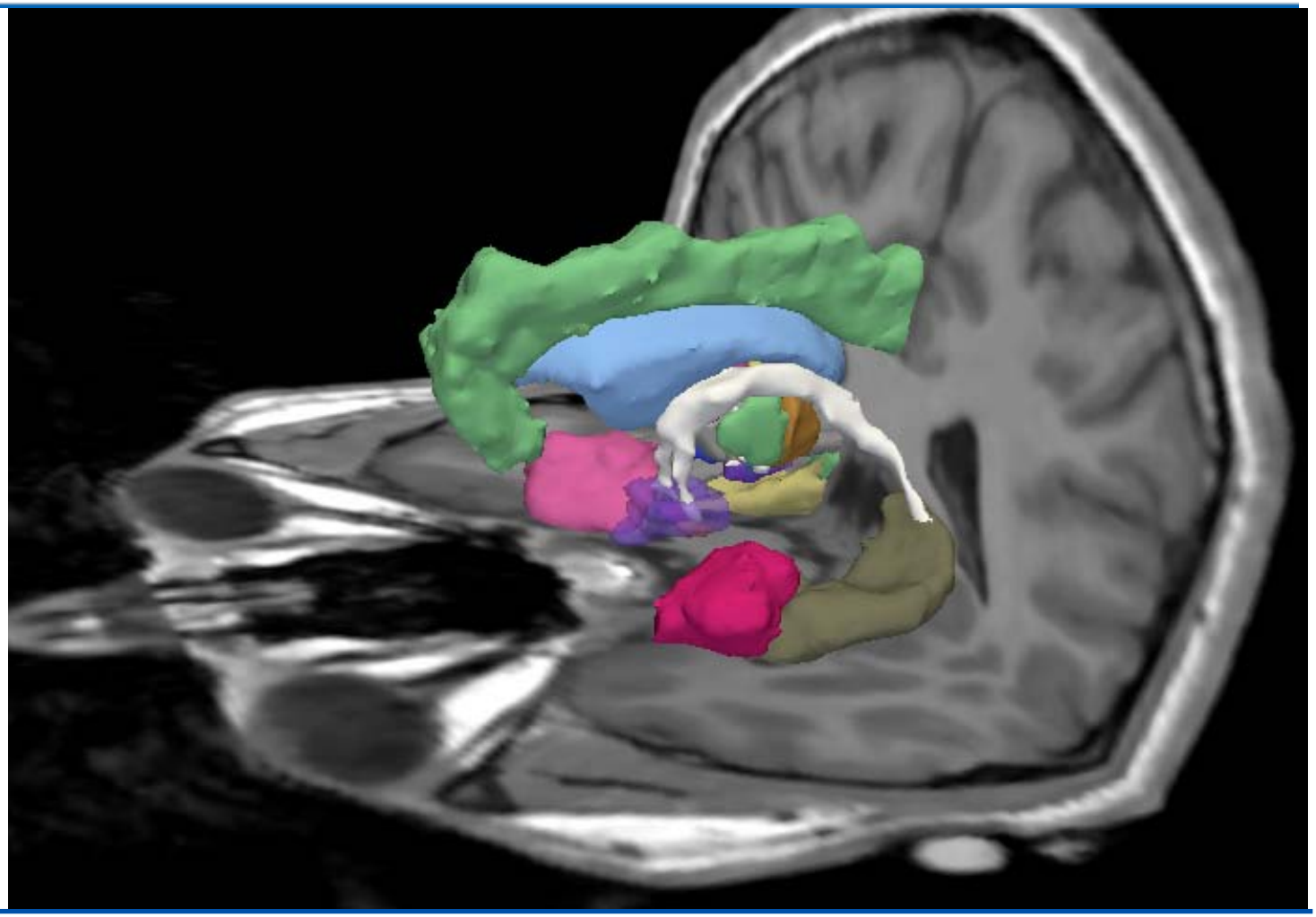
- Single Subject
- Manual Outlines
- Available for download:



Provided by Talos, Halle et al.

SPL Brain Atlas

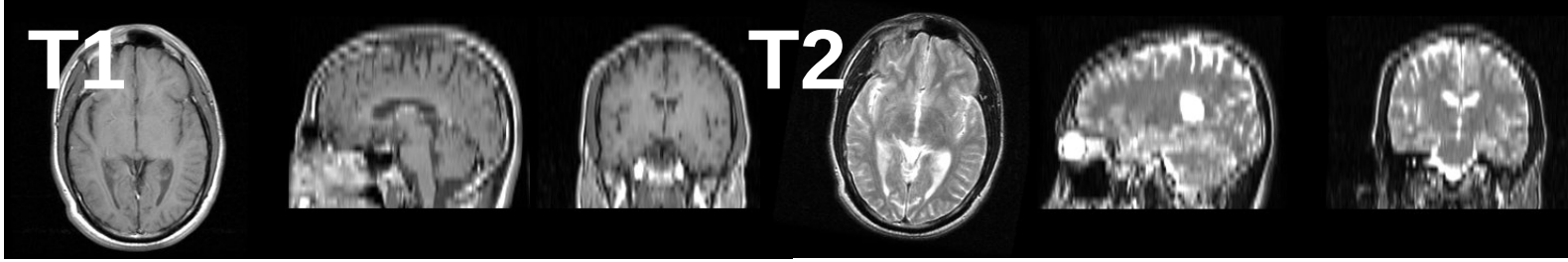
Teaching file: limbic lobe

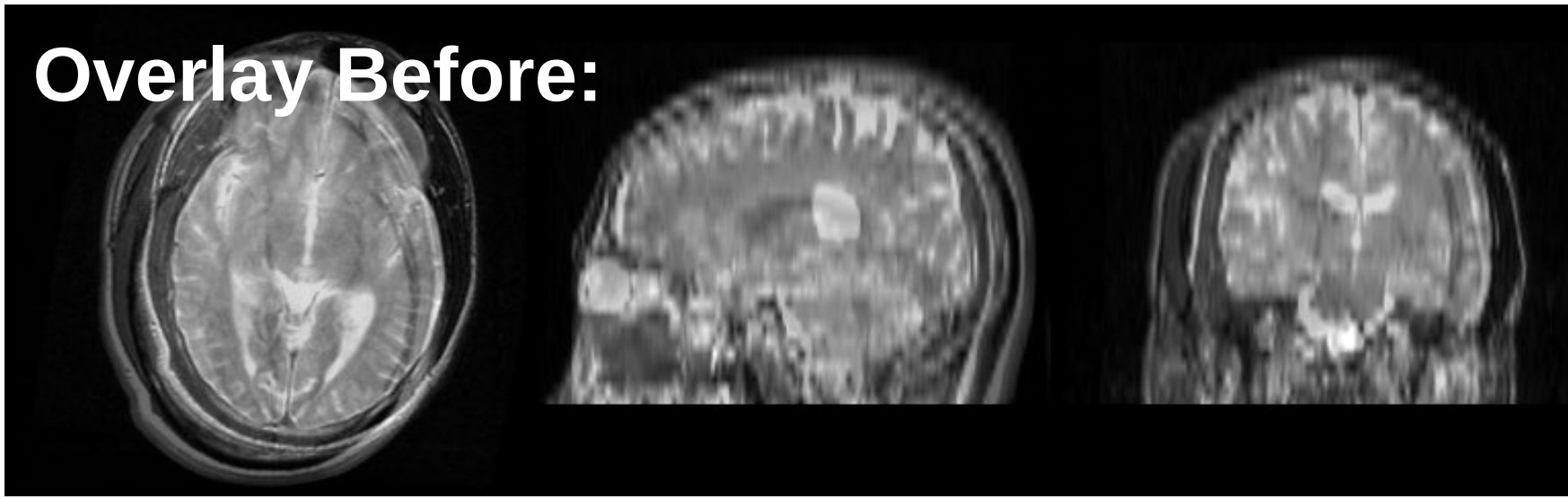


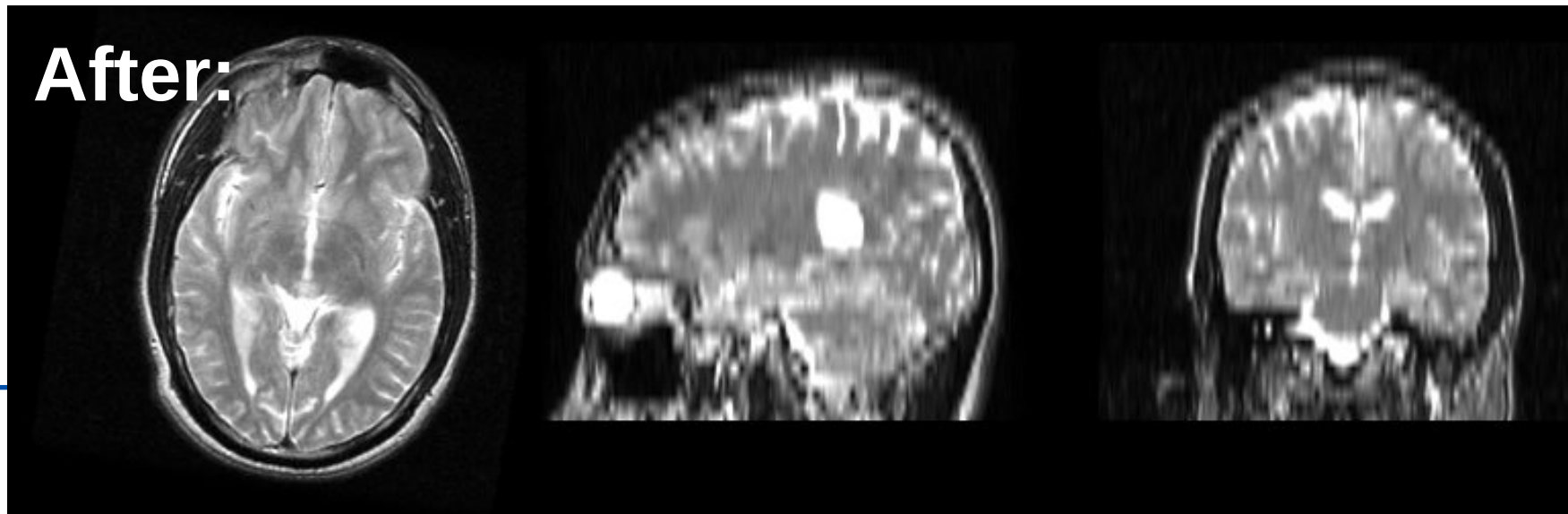
Provided by Talos, Halle et al.

Registration

- Rigid: rotation and translation
  - Models automatically follow volumes
  - Manual
  - Automatic
    - Method of mutual information
    - Uses manual registration as an initial pose
    - Fast for a good initial pose (1 minute)
- Non-Rigid: Demons based AG

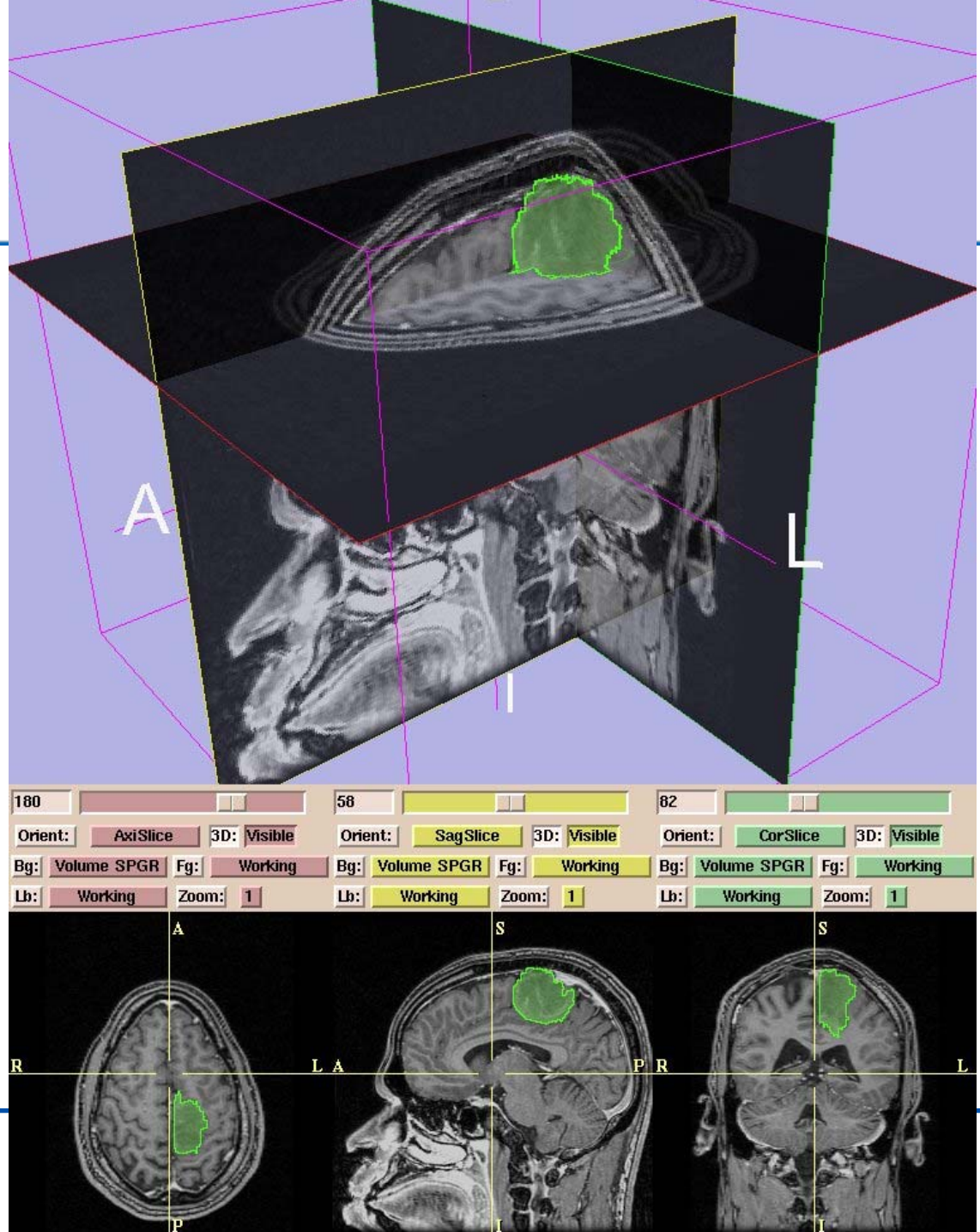

T1
T2


Overlay Before:


After:

Interactive Segmentation

- Functions:
  - Threshold (automated using histogram)
  - Morphological operations
  - Connectivity (island removal)
  - Drawing of points, lines & polygons
- Single-slice, multi-slice, or 3D


A
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CorSlice
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Volume SPGR
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Working
Bg:
Volume SPGR
Fg:
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Volume SPGR
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Zoom:
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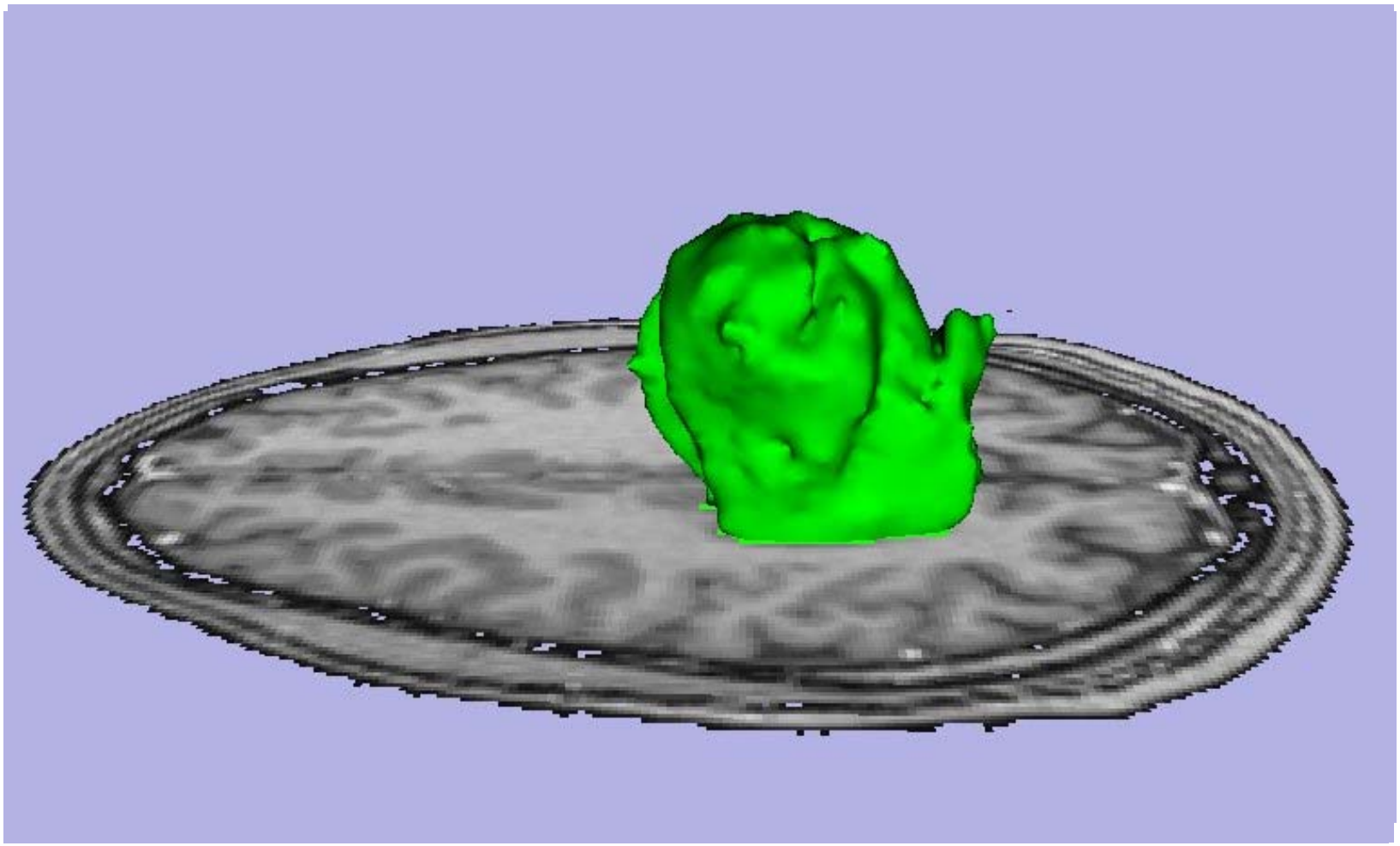
Surface Model Creation

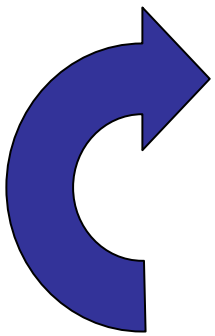


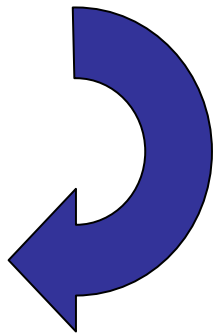
Provided by D. Gering

EP Pipeline: Algorithm

Expectation Step

classifies the MR voxels in tissue classes Gray Matter, White Matter, CSF





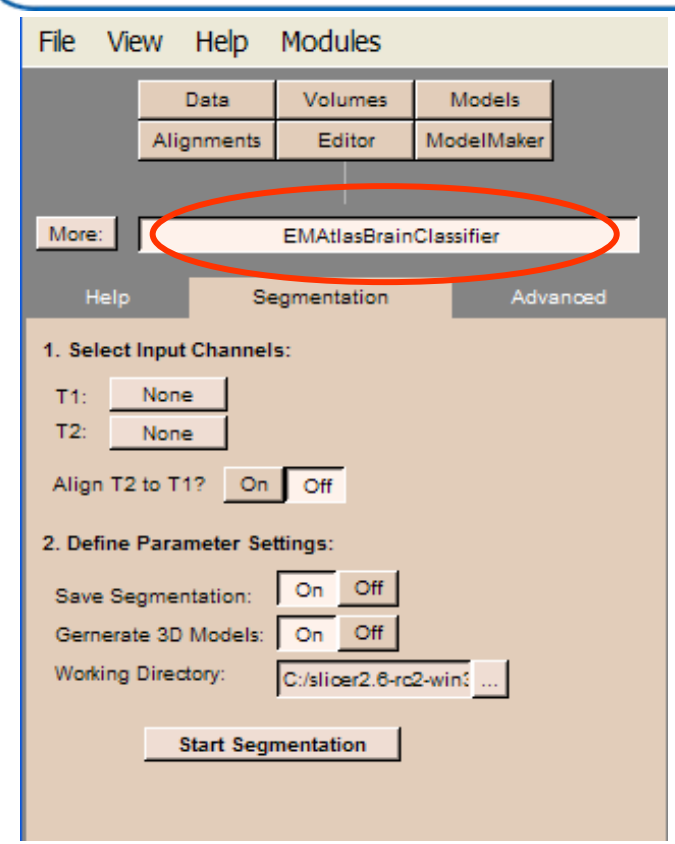
Maximization Step

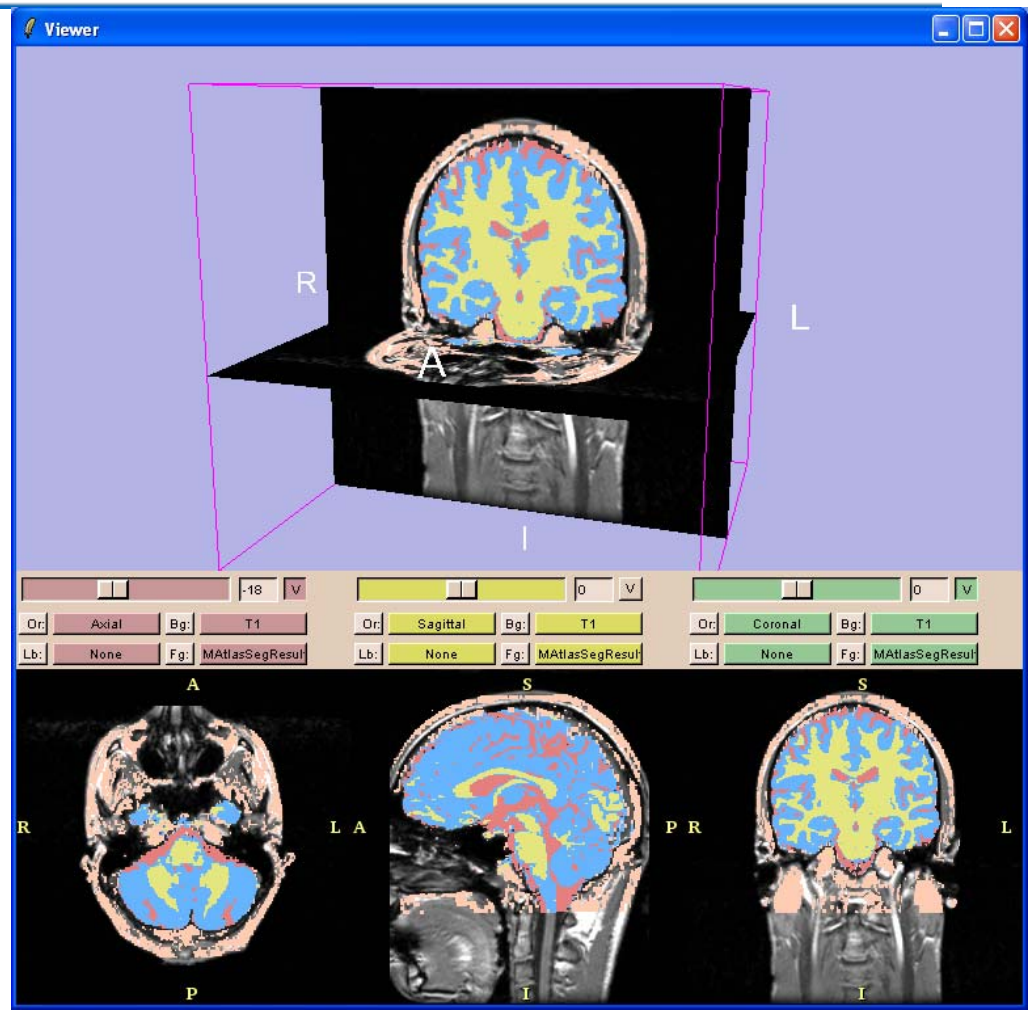
applies the intensity correction as a function of the tissue class

Loop iterated 4 times

Provided by K. Pohl

Segmentation using EM

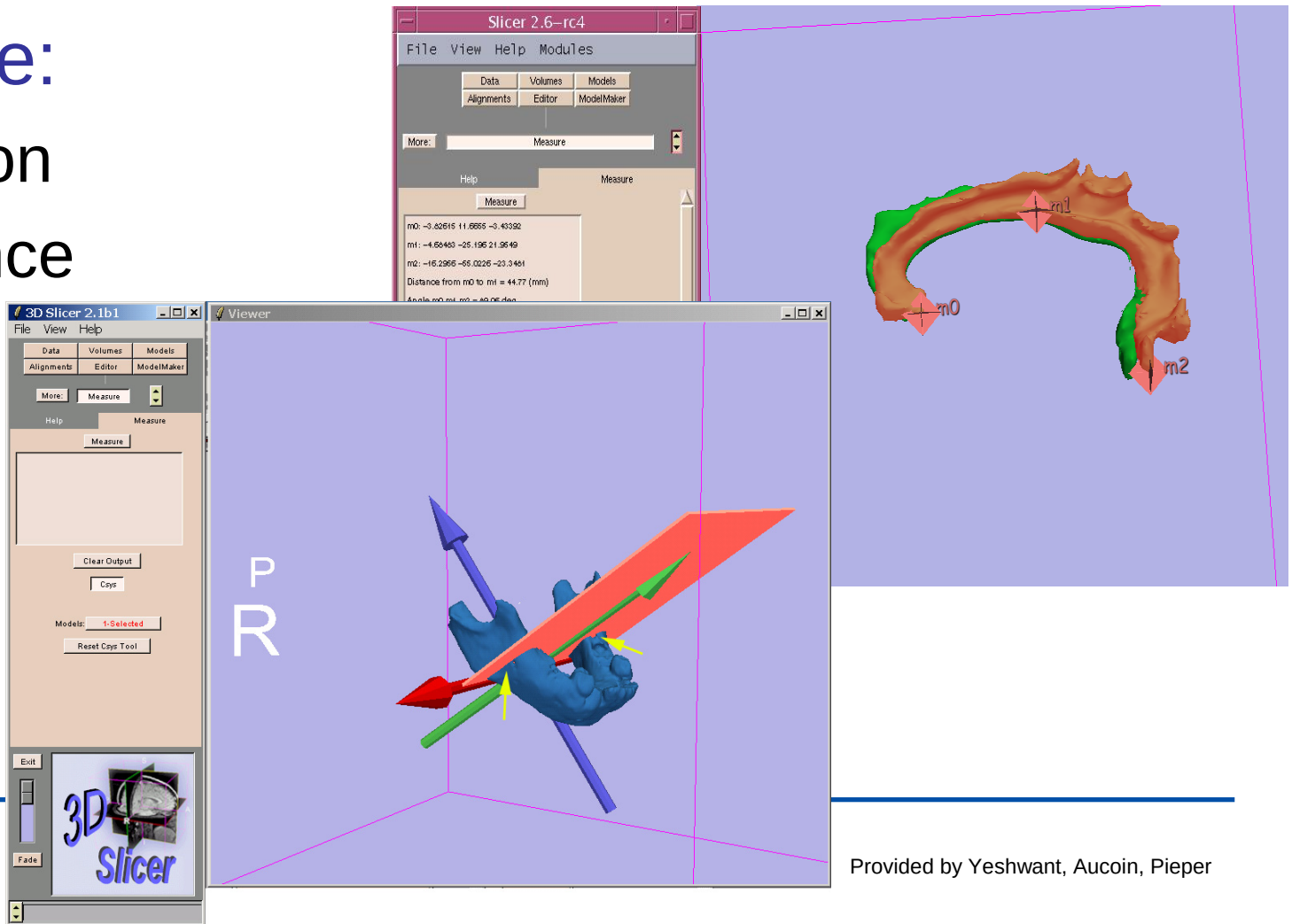




Provided by K. Pohl

Interactive Measurements

- Click on structures in 3D view to measure:
  - Position
  - Distance
  - Angle

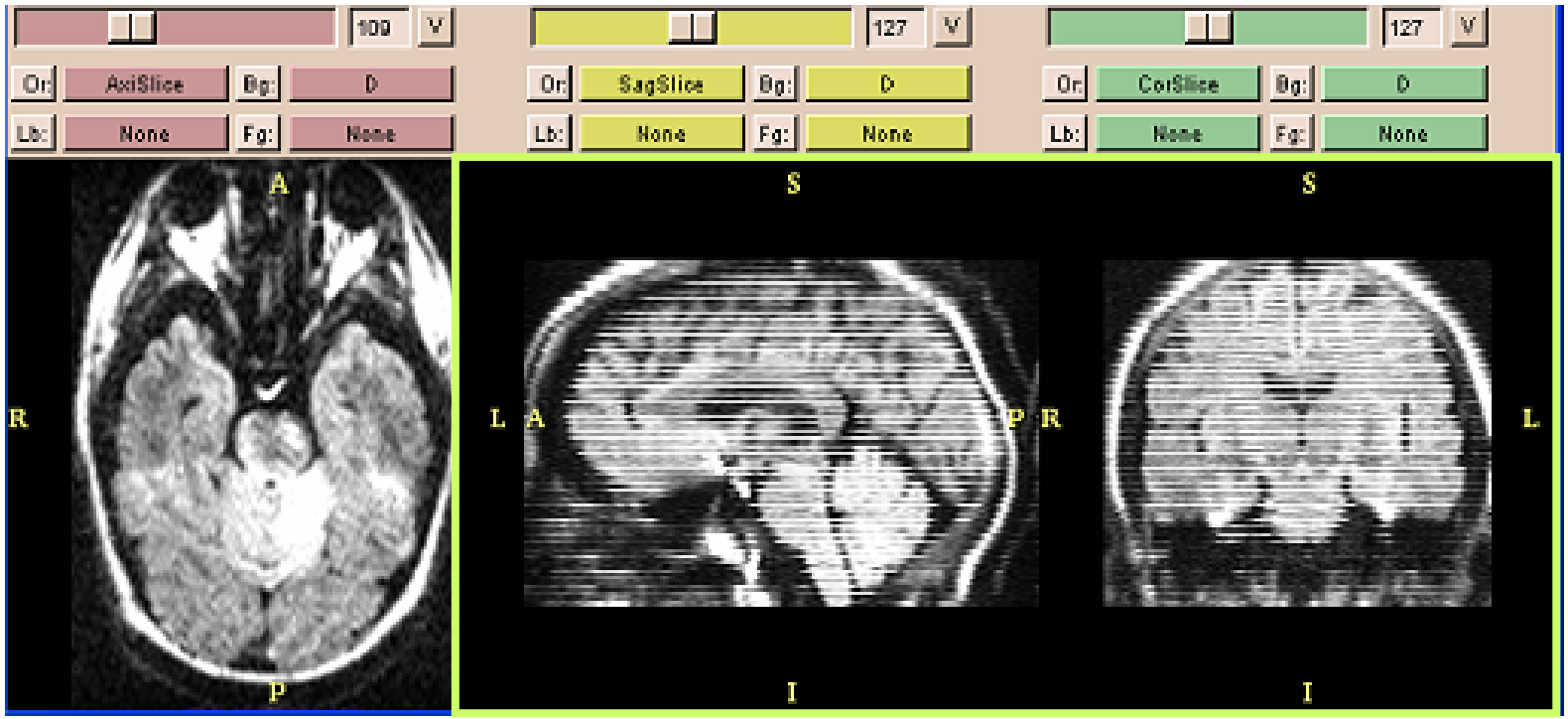


Provided by Yeshwant, Aucoin, Pieper

Examples from the DBP's

- Schizophrenia research is still on the search for a diagnosis based on quantitative methods
- Imaging is complementing clinical assessments with findings which are only significant in group comparisons

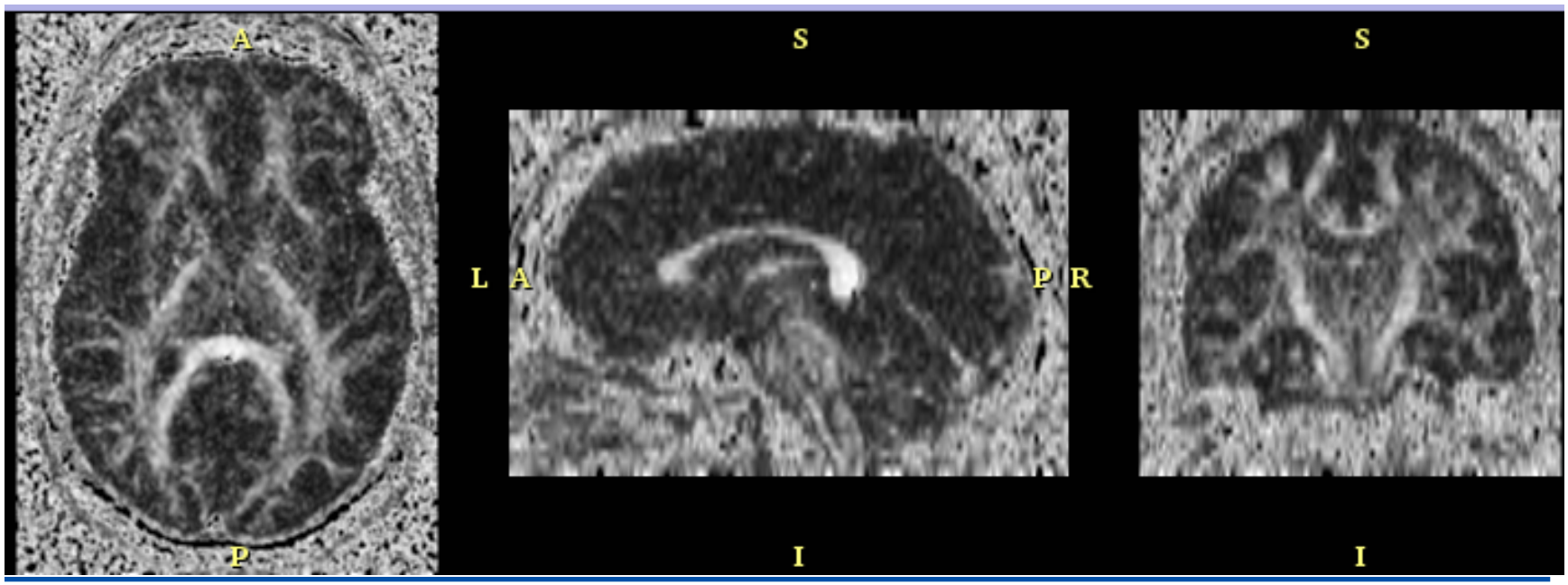
Loading Original DTI data



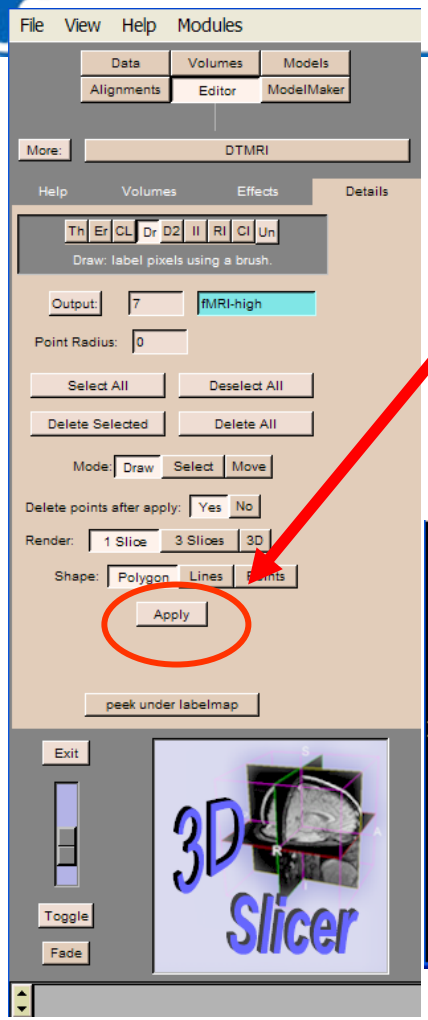
Inspect the original data in the Sagittal and Coronal views

Computing Fractional Anisotropy

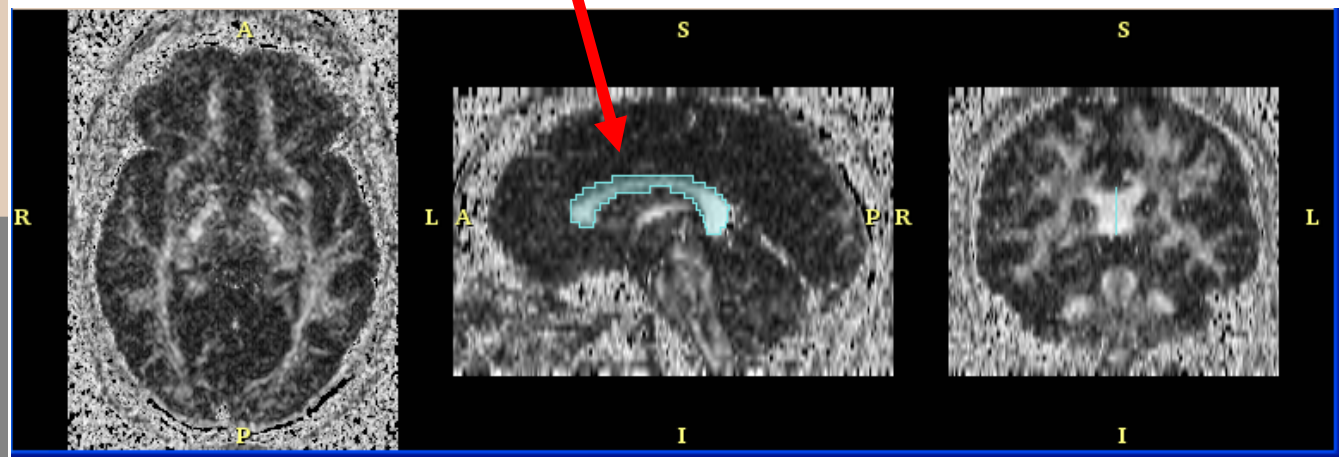
The Viewer displays the FA volume.



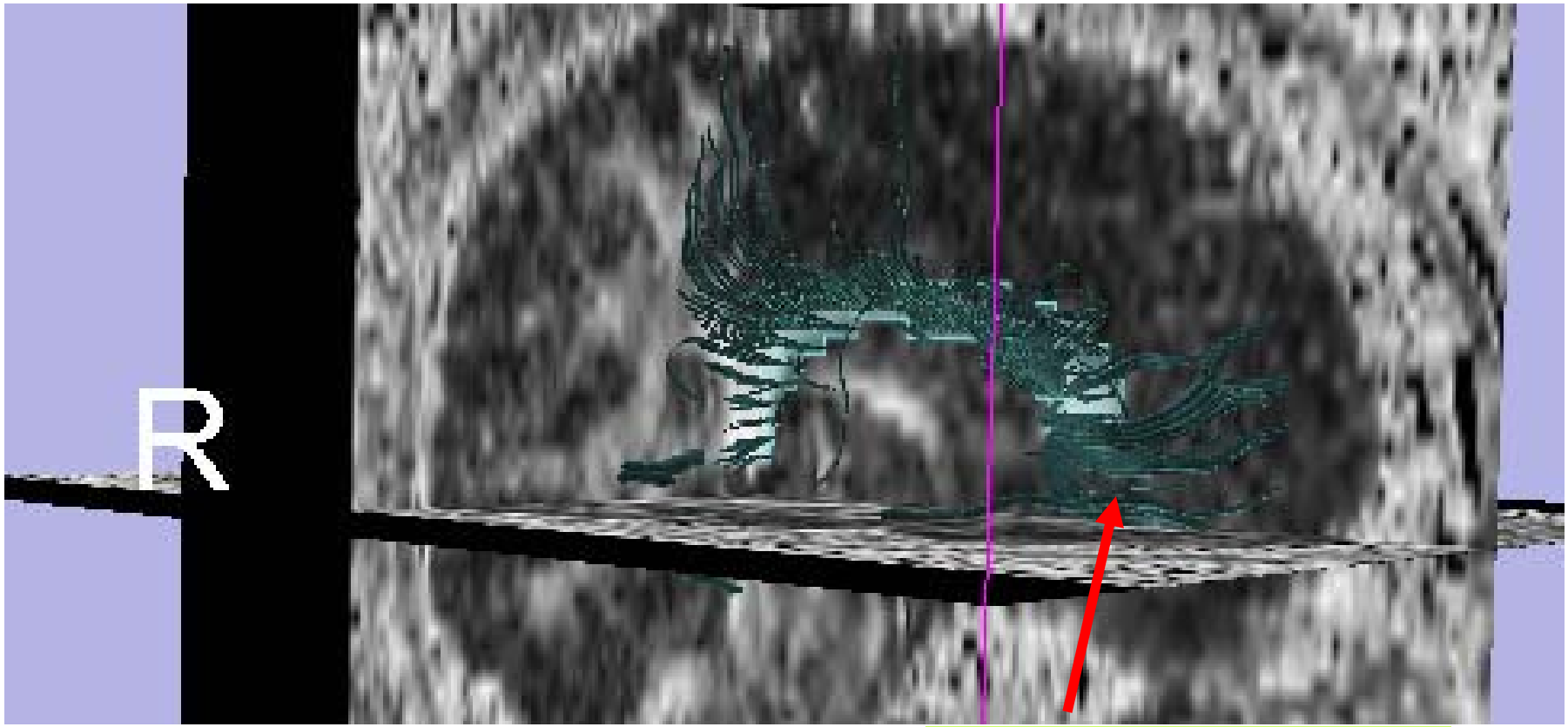
Tract seeding using ROI's



Draw the contour of the corpus callosum in the sagittal slice, and click Apply

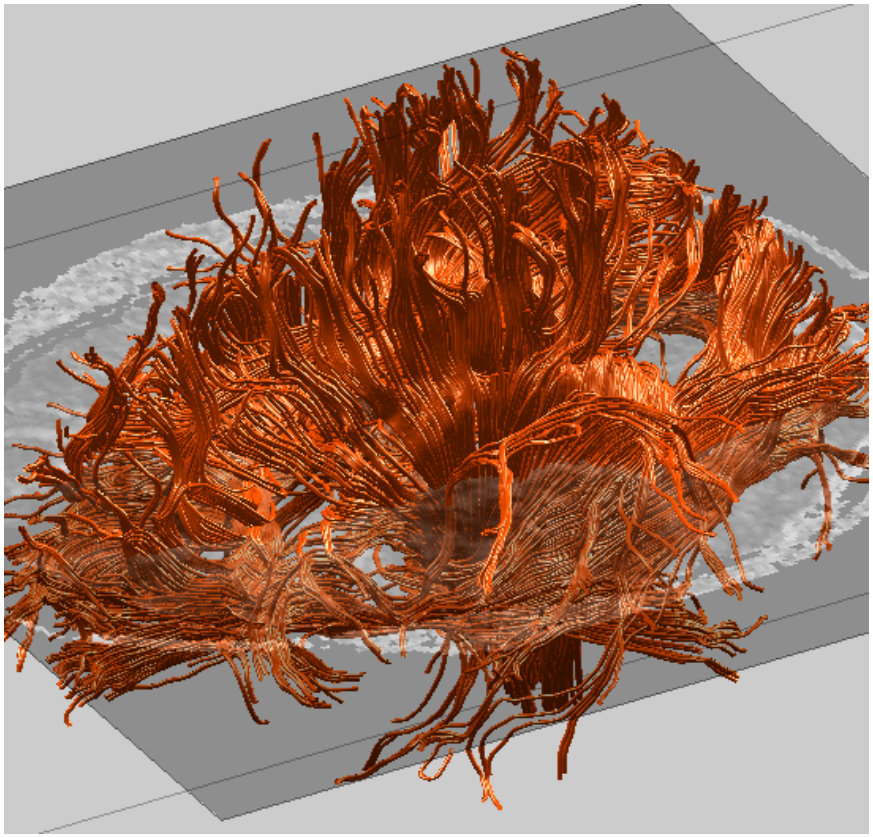


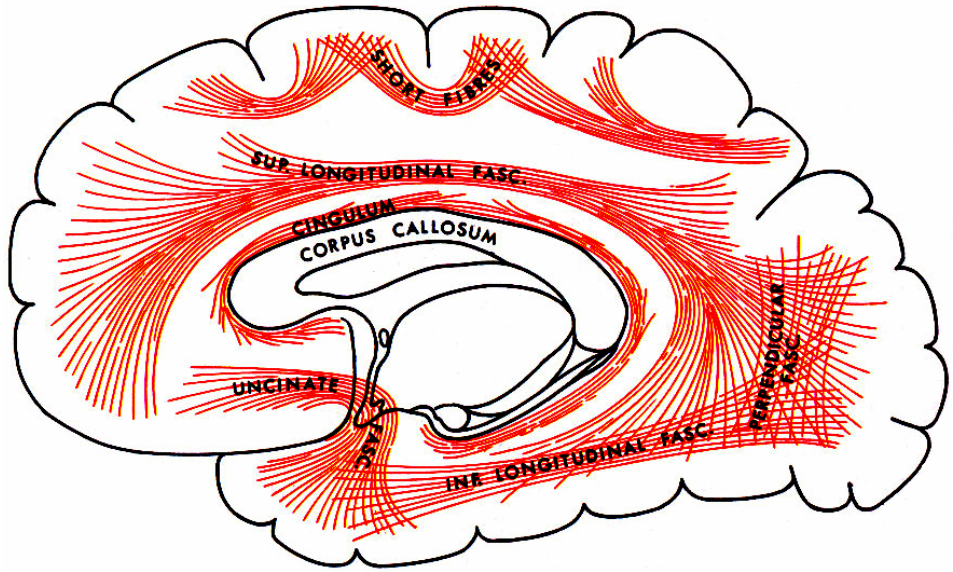
Tracts Through the ROI



The resulting Tracts appear in 3D view.

Fibers to Bundles

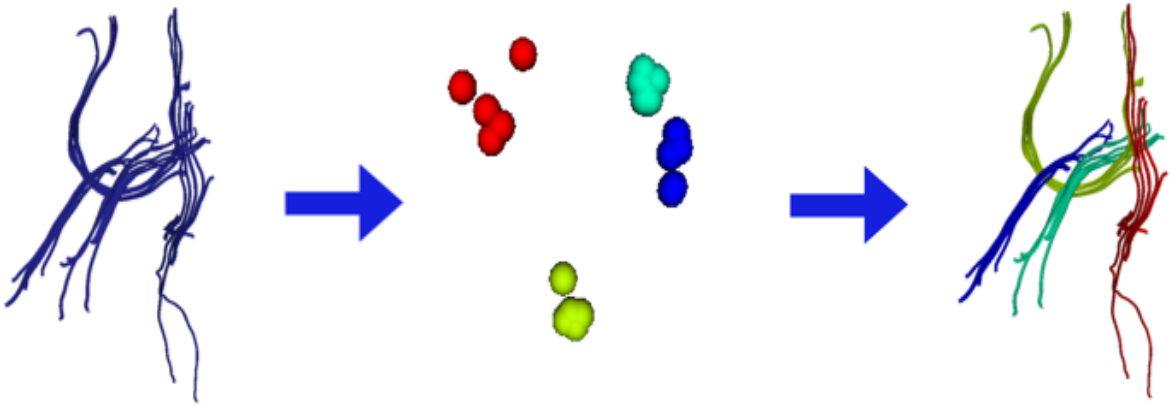




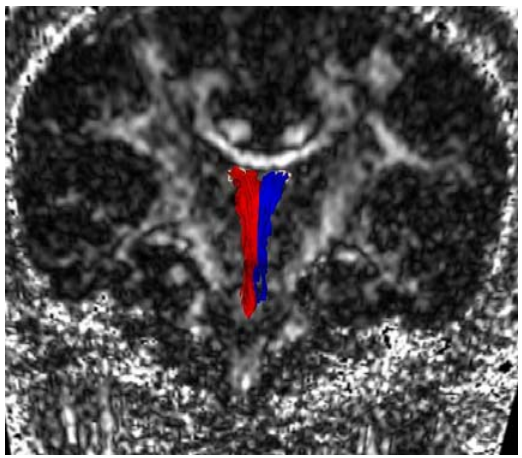
Fibers to bundles using clustering

Provided by CF. Westin Marek Kubicki

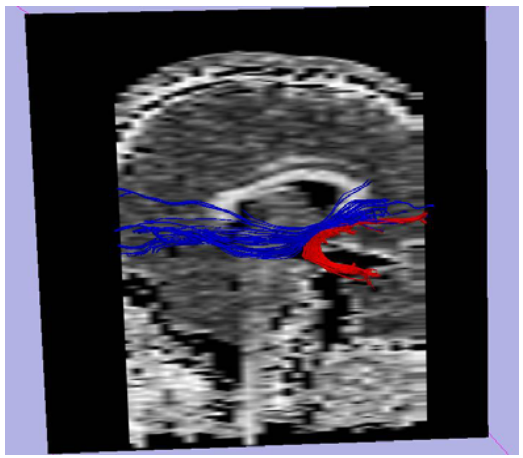
Fiber Clustering



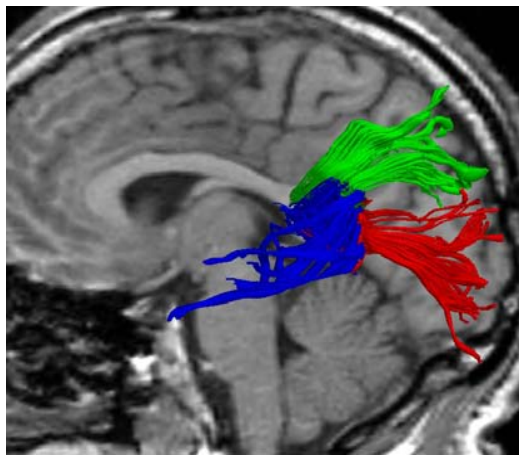
Clustering algorithm: Takes traced fibers (left), extracts features from these fibers (middle), and produces a segmentation based on the similarity (right).



Left and Right Fornix



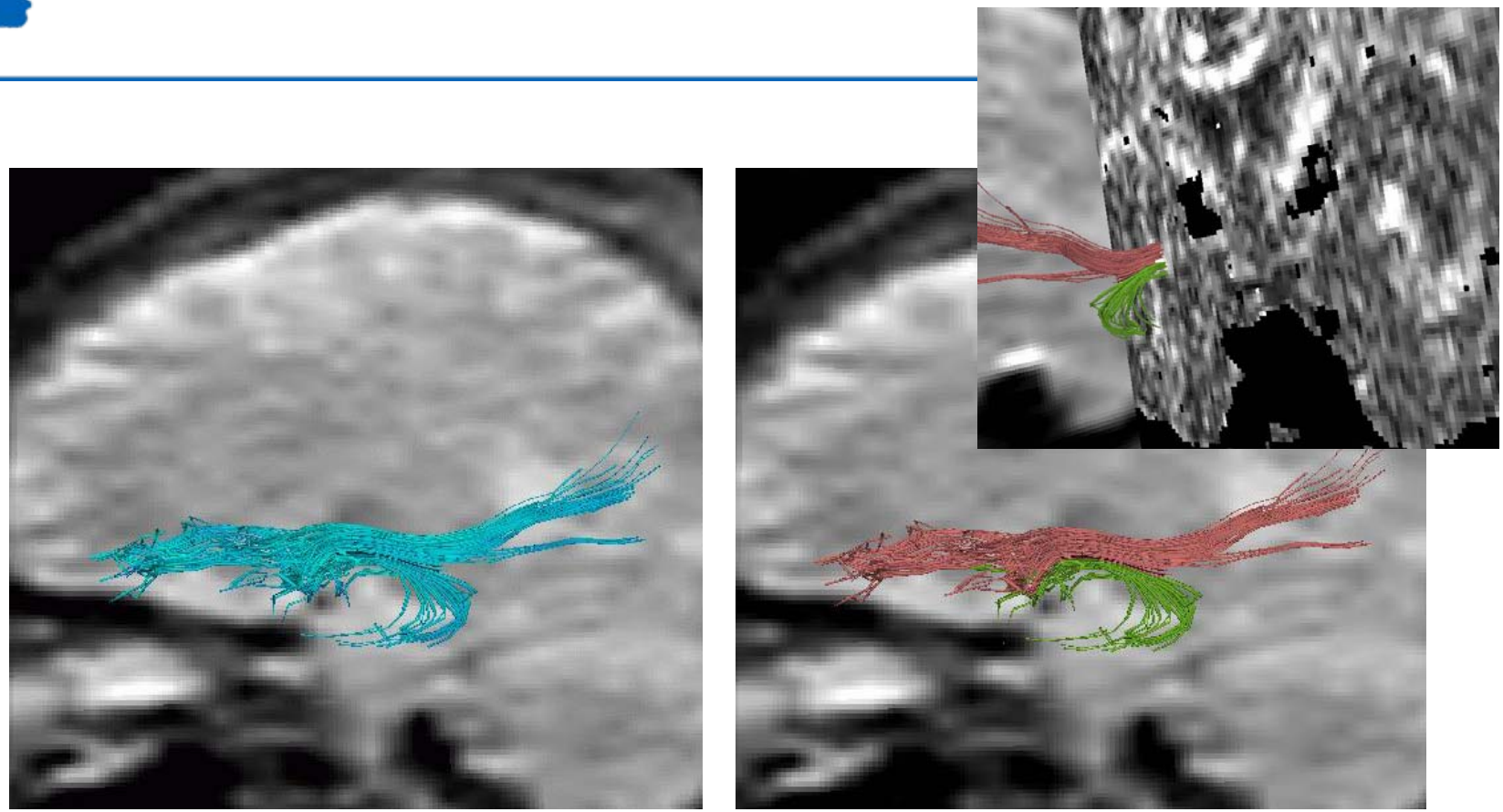
Uncinate Fasciculus and Inferior Occipito-Frontal Fasciculus



Splenium of the Corpus Callosum

[O'Donnell L, Kubicki M, Shenton, ME, Dreusicke M, Grimson E, Westin, CF: A Method for Clustering White Matter Fiber Tracts. *Am J Neuroradiol* (In Press)].

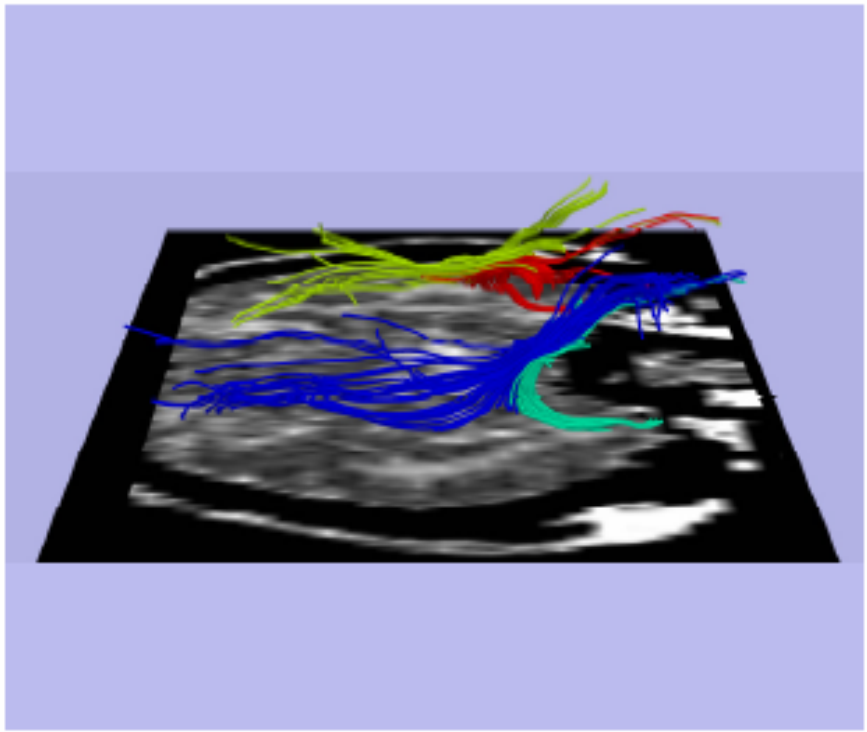
Uncinate Fasciculus

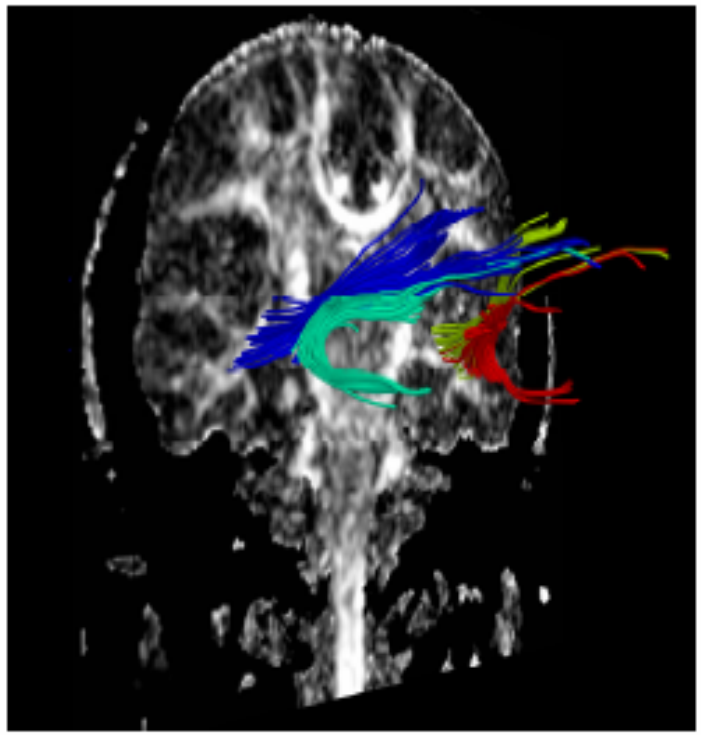


Uncinate fasciculus (green), inferior occipito-frontal fasciculus (red)

Provided by CF. Westin Marek Kubicki

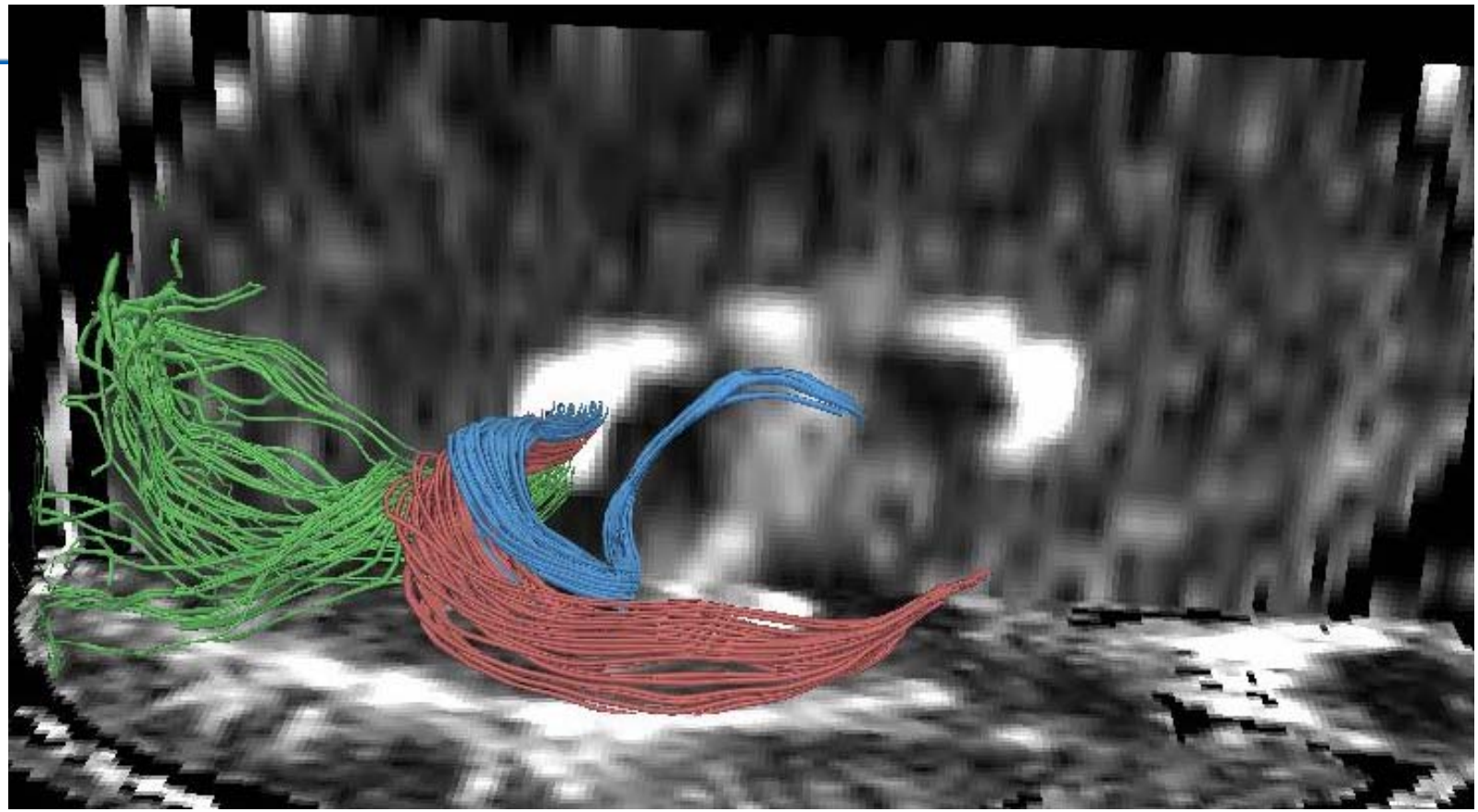
Towards Automated Clustering





Provided by Odonnell, Westin, et al.

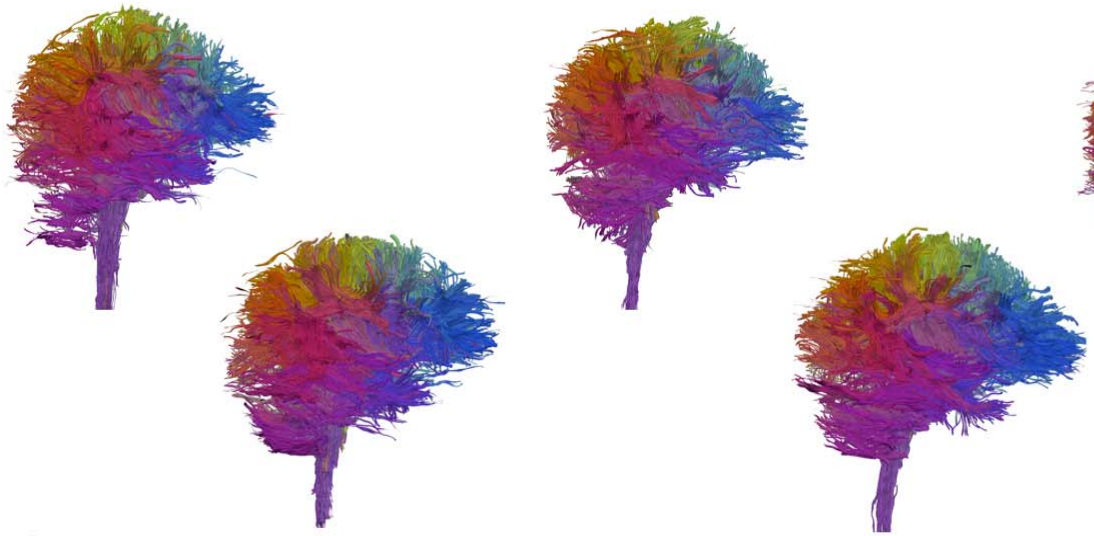
Fibers to Bundles



Splenium of the corpus callosum interconnecting different regions: occipital lobes (green), temporal lobes (red) and thalamus (blue).

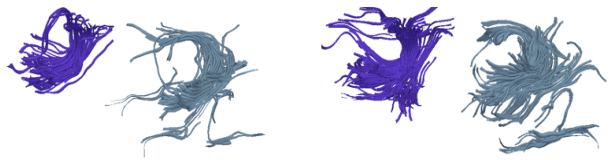
Provided by CF. Westin Marek Kubicki

Population Comparison



Automatic generation of white matter fiber bundles based on shape similarity across subjects.

Cingulum Bundles



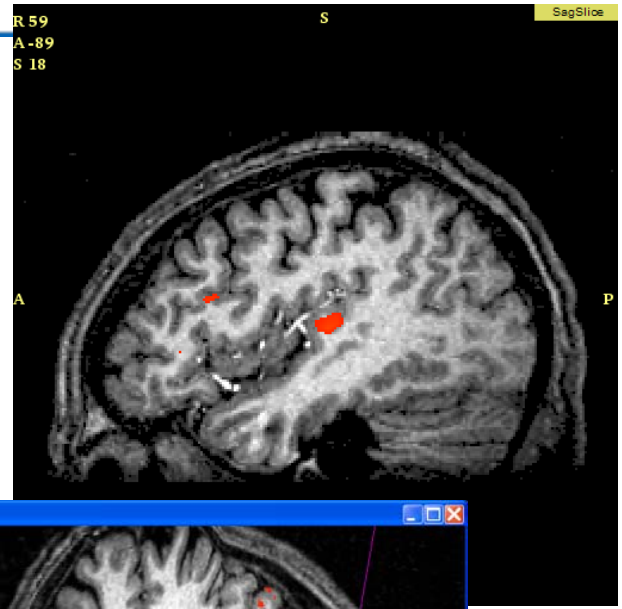
Uncinate Fasciculi

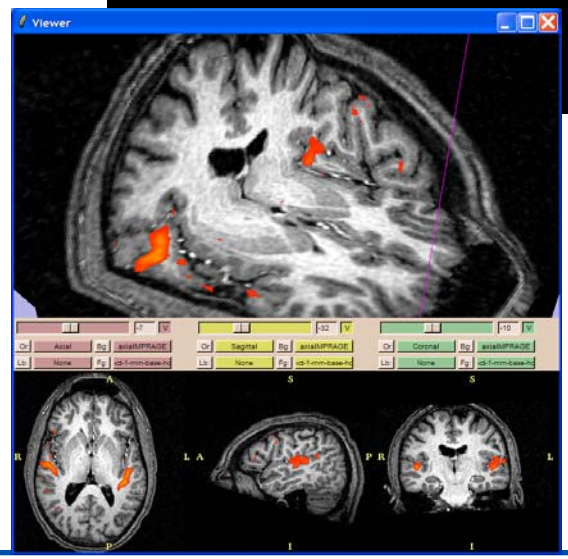
Corpus Callosum

[O'Donnell, et al., MIT]

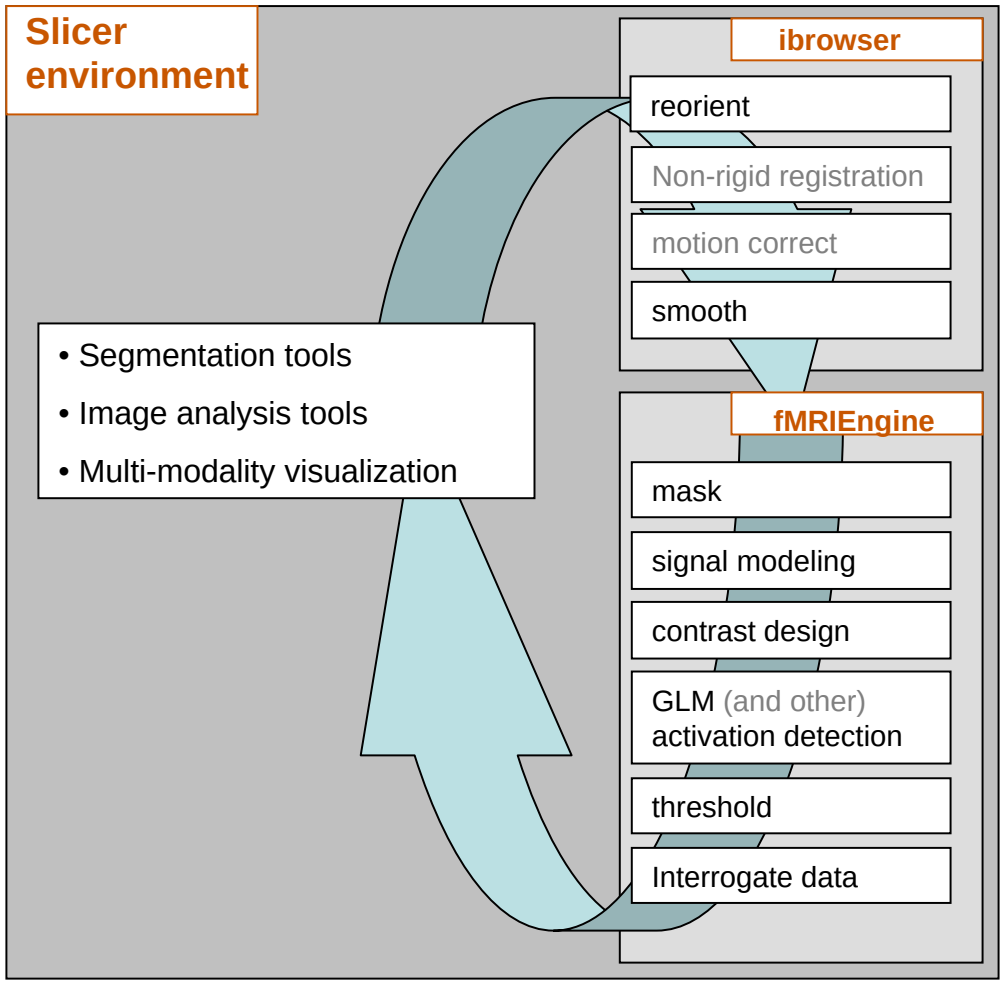
Slicer fMRI Tools: early stage

- Advanced GUI and Interactive Visualization Environment
  - iBrowser
- Platform for Activation Detector Research
  - fMRIEngine
- Framework for fMRI Integration with Other Modalities
- Co-funded by fBIRN, NAC and HCNR



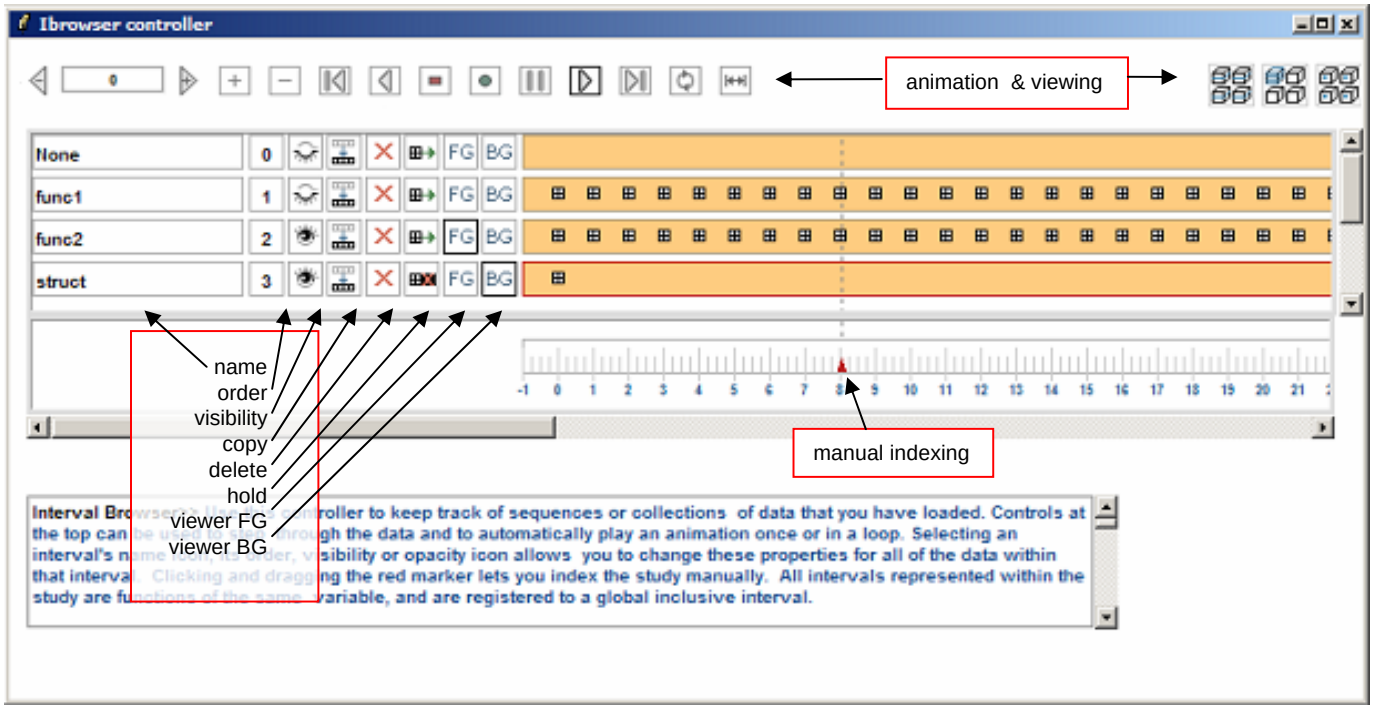


fMRI Integration in Slicer



- implemented functionality
- planned functionality

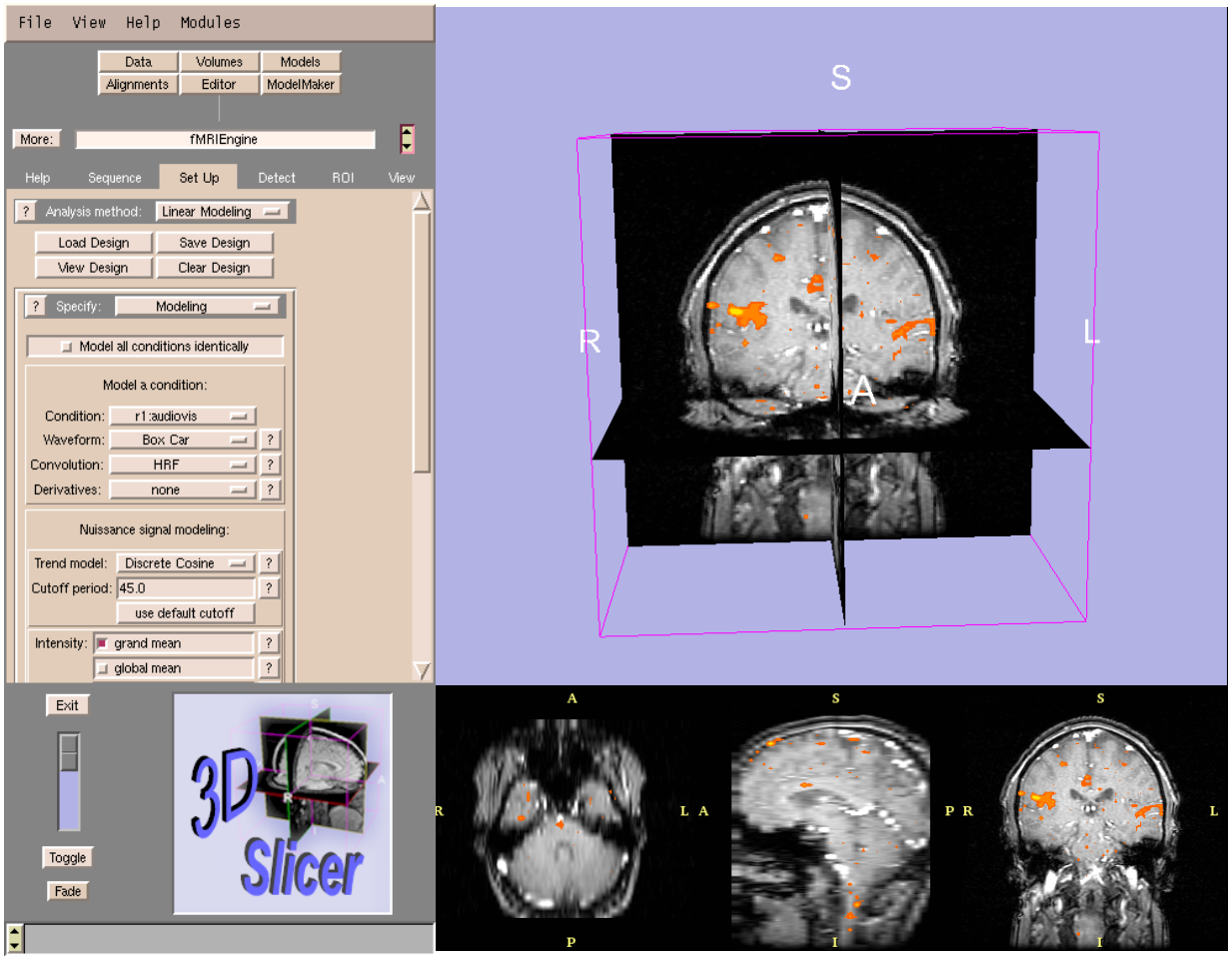
ibrowser: time-series GUI



* GUI controls for indexing, animating, operating on sequences of volumes;
* GUI panel provides a graphical schematic of loaded volume sequences.

W. Plesniak, S. Pieper, W. Wells

fMRIEngine: visualization

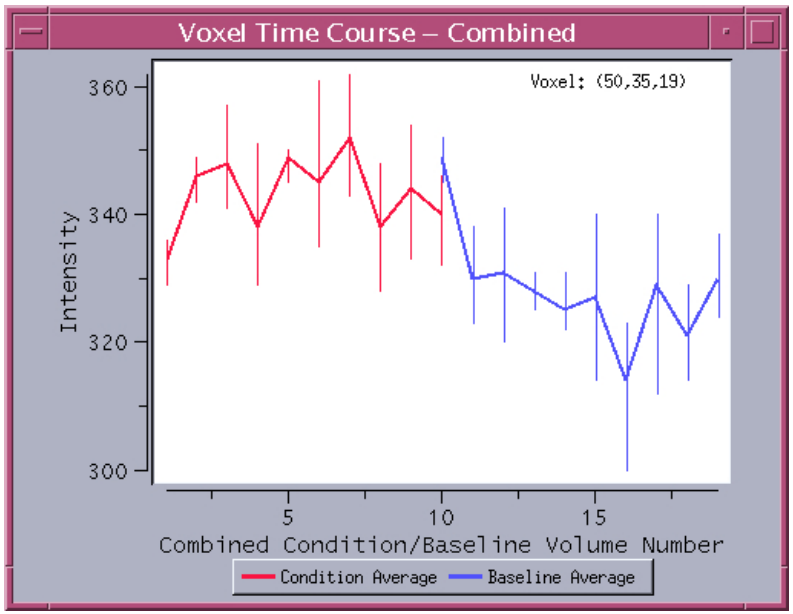


- generates color-coded parametric map of activation
- 3D visualization of activation in the context of subject's own anatomy or in a standardized morphological space;
- provides interactive activation filtering, ROI analysis, and plotting.

H. Liu, C. Richter, W. Plesniak, S. Pieper, W. Wells, C. Wible

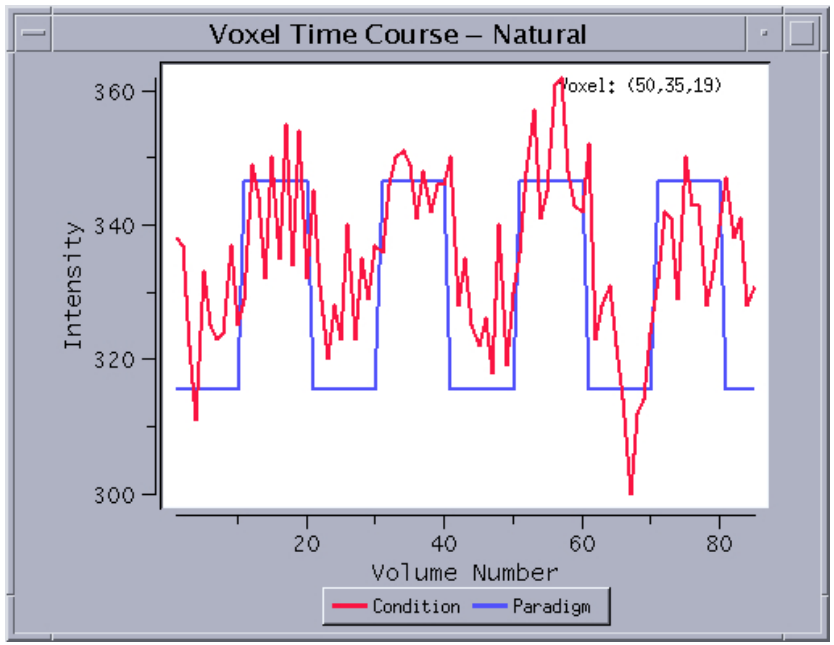
fMRIEngine: data inspection

- **interactive inspection** of voxel timecourse.



Average voxel timecourse for all volumes in each of two experimental conditions

Measured voxel timecourse over entire protocol

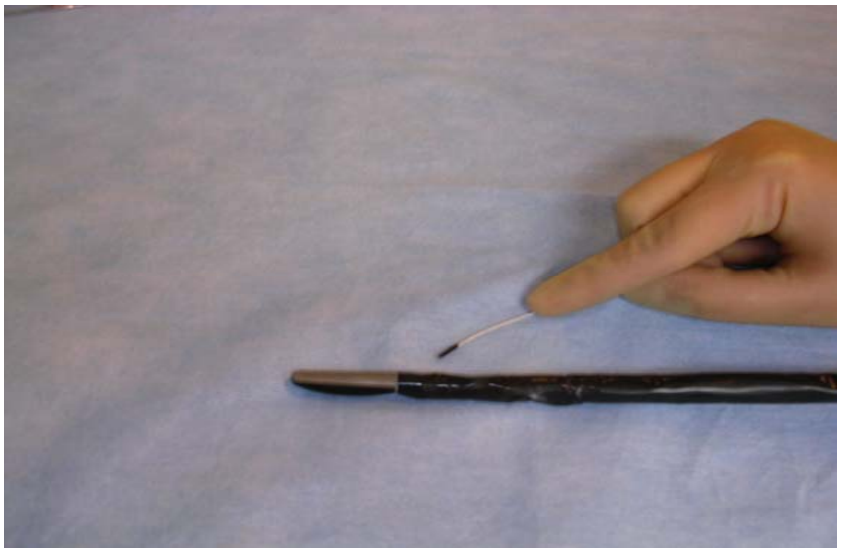


H. Liu, C. Richter, W. Plesniak, S. Pieper, W. Wells, C. Wible

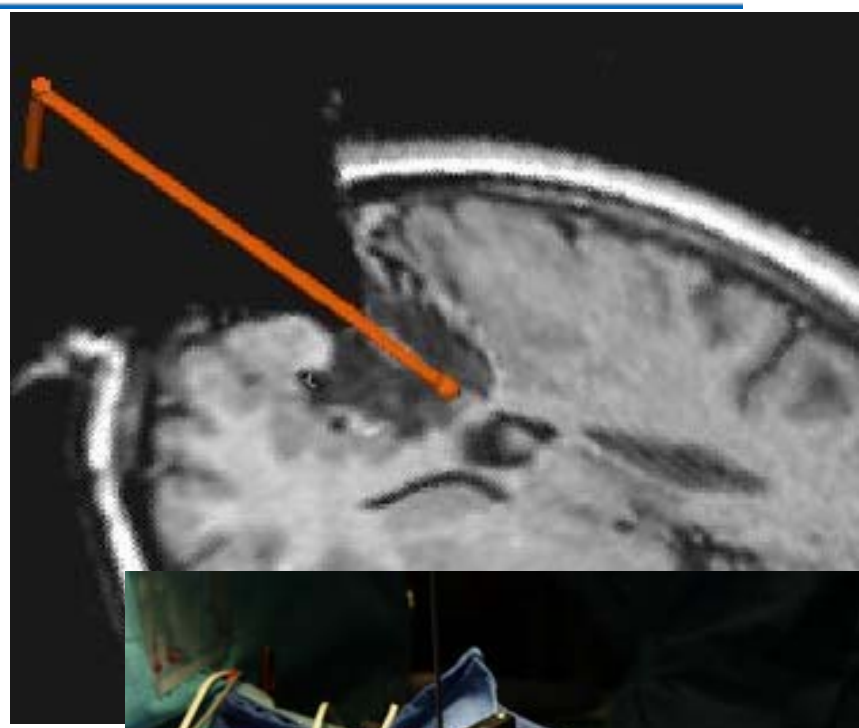
National Center for IGT

- A National Resource Center for developing
  - novel technologies and
  - clinical applications for IGT
- U41 RR019703
- Supported by NCRR, NCI, NIBIB, Industry and other sources of funding
- F. Jolesz, PI

We do Tracking



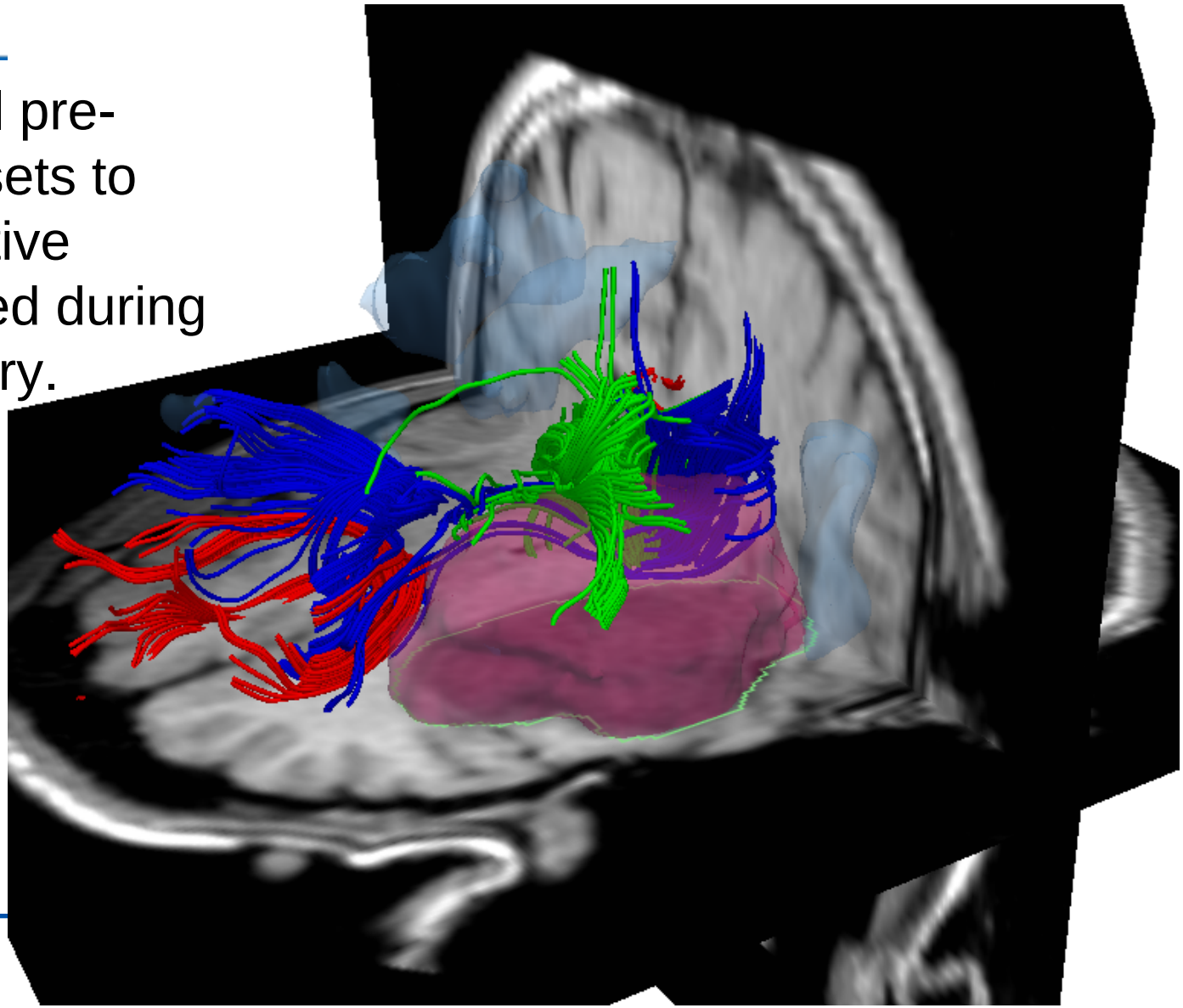
Micro Sensor



We do mapping

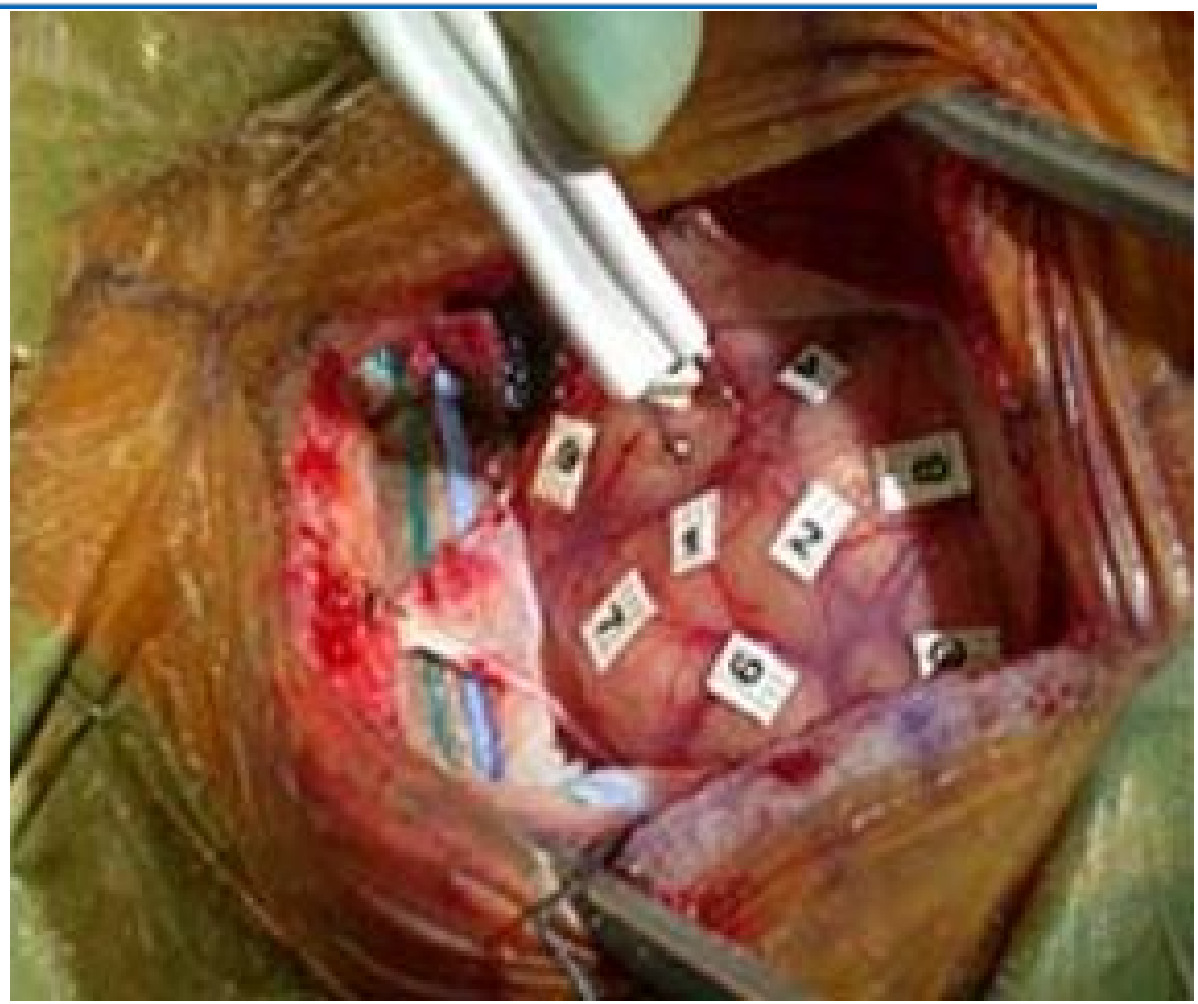
Provided by Archip, Warfield

Alignment of all pre-operative datasets to the intra-operative images achieved during the neurosurgery.



Direct Cortical Stimulation

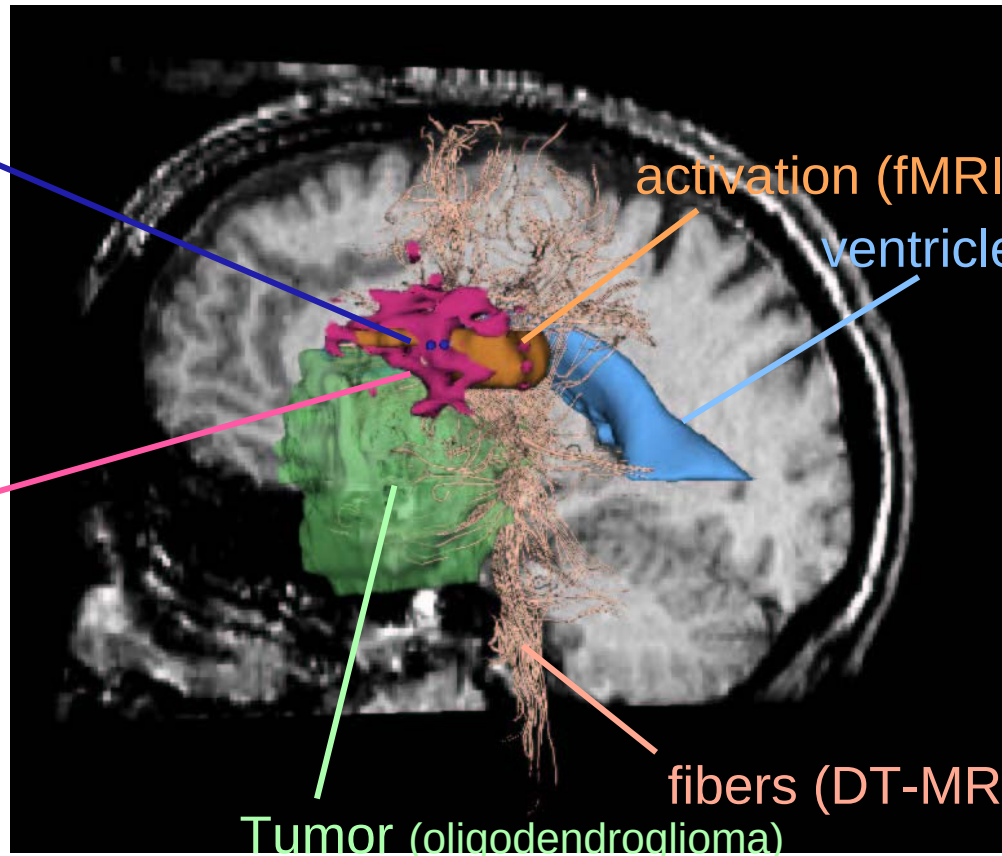
- Quantitative Comparison of Direct-Cortical Stimulation (DCS) and Functional MRI (fMRI) for Surgical Planning
- Clinical Goal: locate eloquent cortex to minimize damage in surgery
- Collaboration with SCI in UTAH. BioPSE was used to model current distribution of DCS



Provided by A. Golby

DCS Simulation

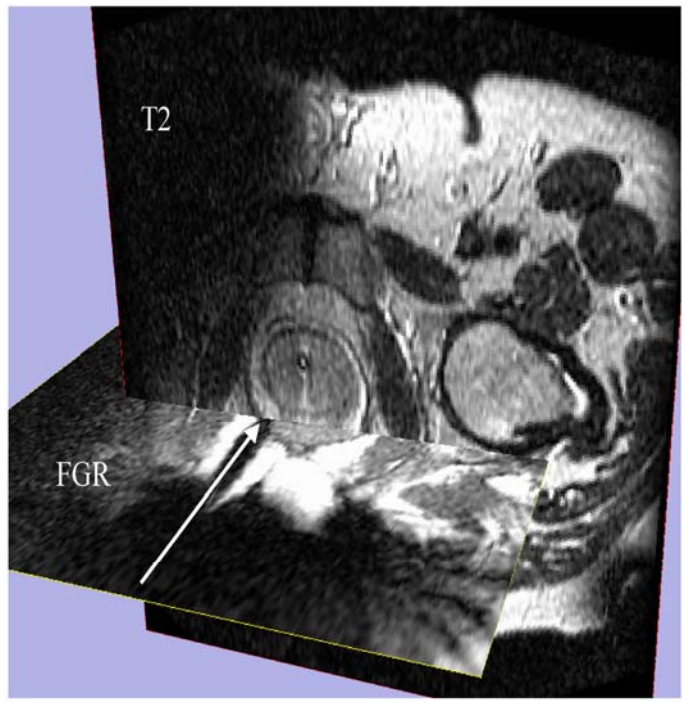
- Scientific Result: ECS location with inhibition had maximal correlation with fMRI activation in Brocca's area



Provided by S. Larsen, S. Wells

We Study Prostates

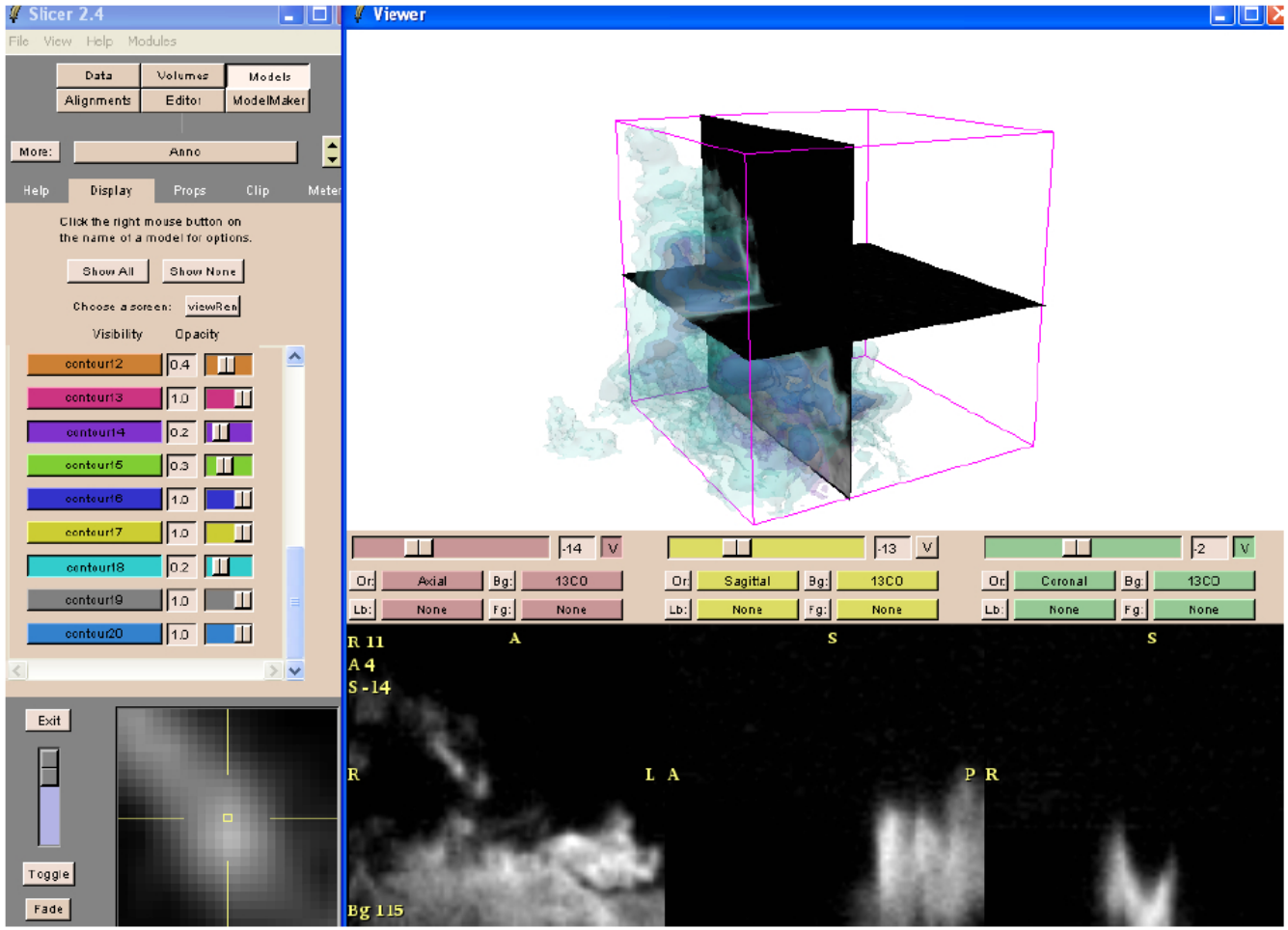
- Segmentation tool for Brachytherapy Planning and Biopsy
- Navigation for Biopsy
- Future FUS and Robot Applications



Provided by Haker, Tempany et al.

And we do Stars too ;)

Spectral data was converted to a velocity distribution from 0 to 20 km/s sampled into about 300 bins for both the ^{13}CO (diffuse clouds) and $C^{18}O$ molecular spectral lines (dense regions and cores).



Provided by Halle, Borkin, Goodman

NA-MIC Kit

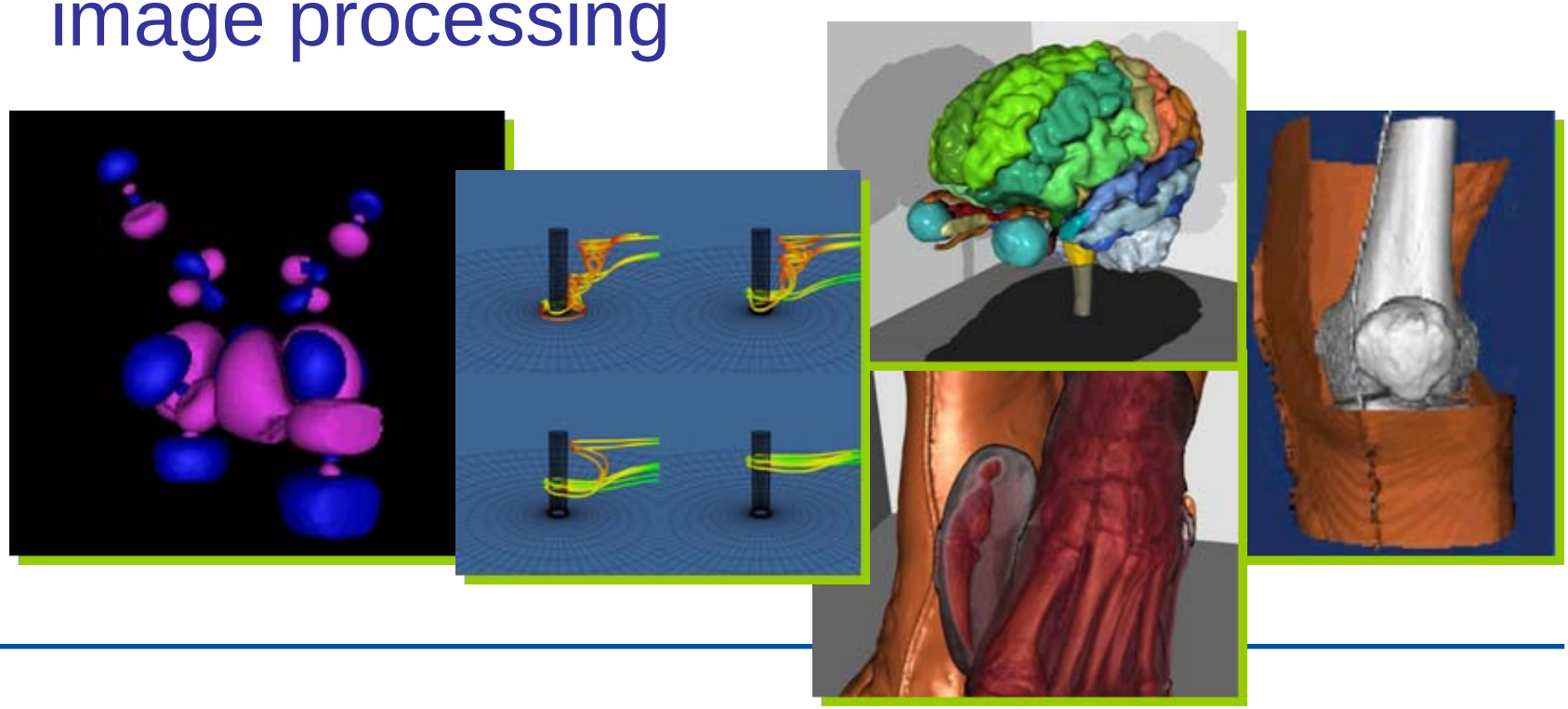
Behind the Scenes

NA-MIC Kit

The Visualization Toolkit

Visualization Toolkit - vtk

Open source toolkit for scientific visualization, computer graphics, and image processing



NA-MIC Kit

The Insight Toolkit

NA-MIC Kit

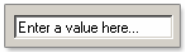
KWWidgets

KWWidgets

- A GUI toolkit:
  - Cross-platform
  - BSD style open-license
  - Free
  - Tested
- A toolkit that provides:
  - Low-level and high-level visualization-oriented widgets
  - Over 100 C++ classes used in open-source and commercial applications for more than 7 years
  - User-interface building-blocks for VTK and ITK objects
  - Tcl and Python bindings for fast-prototyping

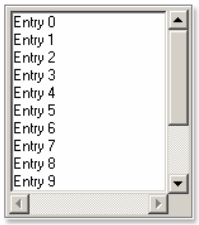
KWWidgets

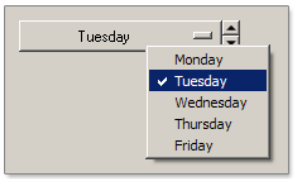

Inbox
Outbox
Kitware
Berk Geveci
Sebastien Barre
Ken Martin


Enter a value here...


A scale:
40


A push button


Entry 0
Entry 1
Entry 2
Entry 3
Entry 4
Entry 5
Entry 6
Entry 7
Entry 8
Entry 9

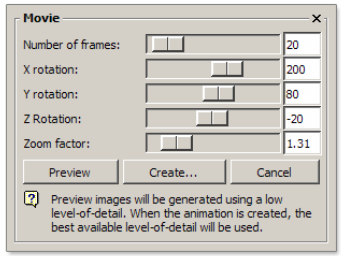

Tuesday
Monday
Tuesday
Wednesday
Thursday
Friday

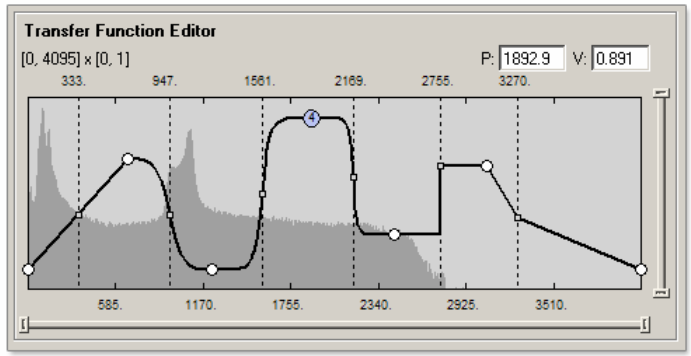

A radiobutton

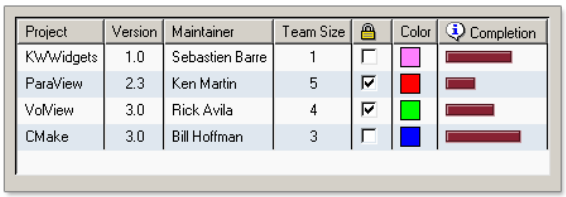

A checkbutton

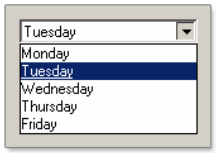

12.0

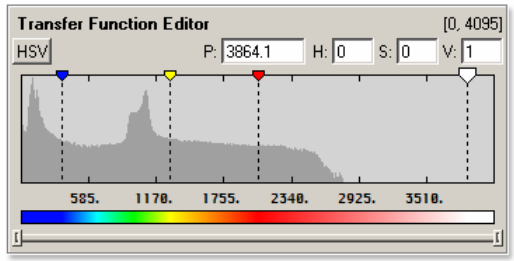

A thumbwheel:


Movie
Number of frames:
20
X rotation:
200
Y rotation:
80
Z Rotation:
-20
Zoom factor:
1.31
Preview
Create...
Cancel
Preview images will be generated using a low level-of-detail. When the animation is created, the best available level-of-detail will be used.


Transfer Function Editor
[0, 4095] x [0, 1]
P: 1892.9
V: 0.891
333.
947.
1561.
2169.
2755.
3270.
585.
1170.
1755.
2340.
2925.
3510.


Project
Version
Maintainer
Team Size
Color
Completion
KWWidgets 1.0 Sebastien Barre 1
ParaView 2.3 Ken Martin 5
VolView 3.0 Rick Avila 4
CMake 3.0 Bill Hoffman 3


Tuesday
Monday
Tuesday
Wednesday
Thursday
Friday


Transfer Function Editor
[0, 4095]
HSV
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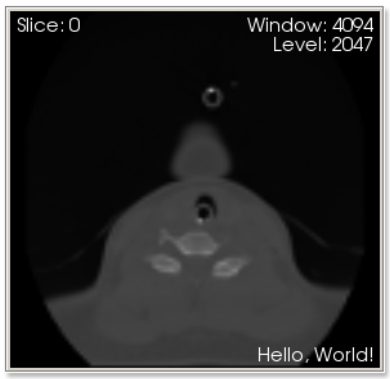
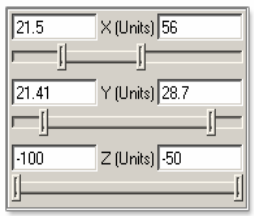
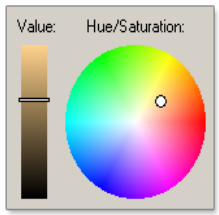
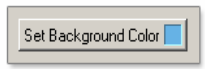
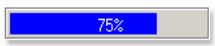
S: 0
V: 1
585.
1170.
1755.
2340.
2925.
3510.

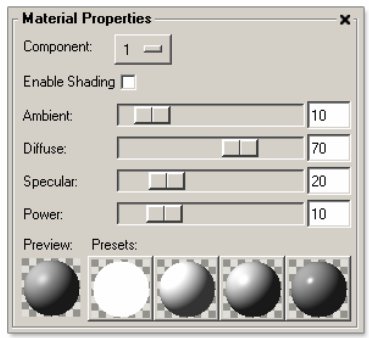

Slice: 0
Window: 4094
Level: 2047
Hello, World!


21.5
X (Units)
56
21.41
Y (Units)
28.7
-100
Z (Units)
-50


Value:
Hue/Saturation:


Set Background Color

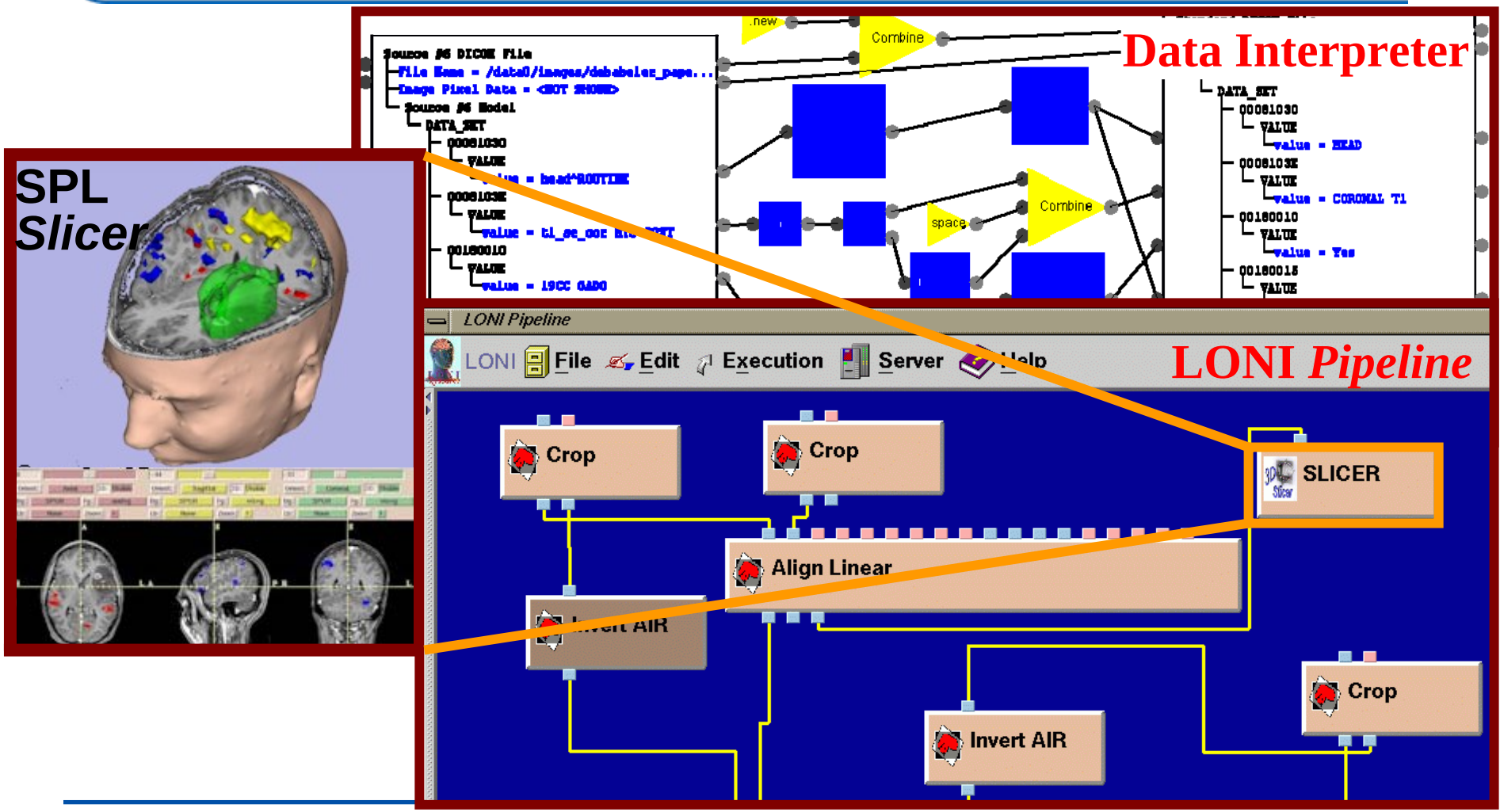

75%


Material Properties
Component:
1
Enable Shading
Ambient:
10
Diffuse:
70
Specular:
20
Power:
10
Preview:
Presets:

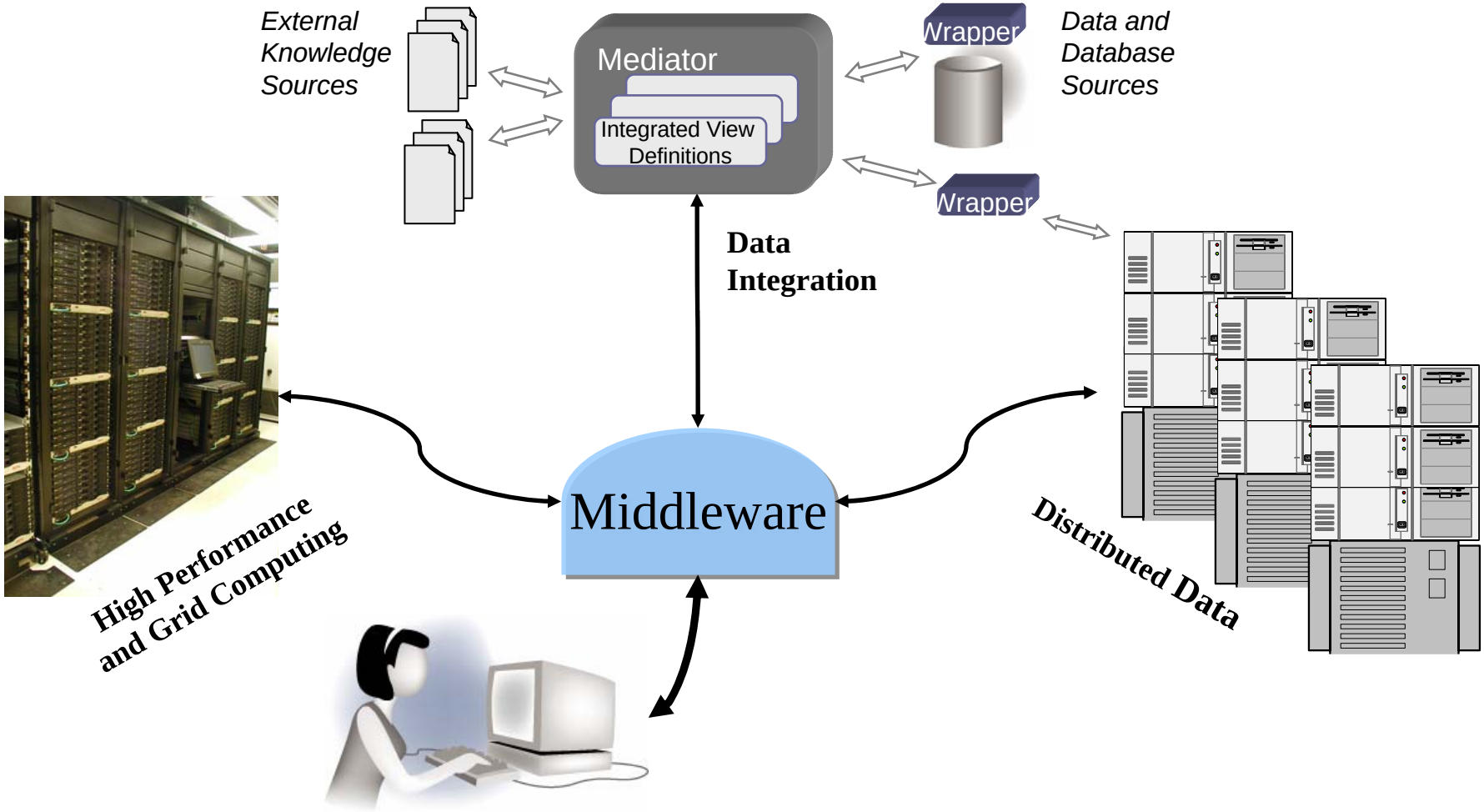
NA-MIC Kit

Large Scale Data Processing

UCLA-LONI


Data Interpreter
SPL
Slicer
LONI Pipeline
LONI
File
Edit
Execution
Server
Help
LONI Pipeline
Crop
Crop
SLICER
Align Linear
Invert AIR
Crop
Invert AIR

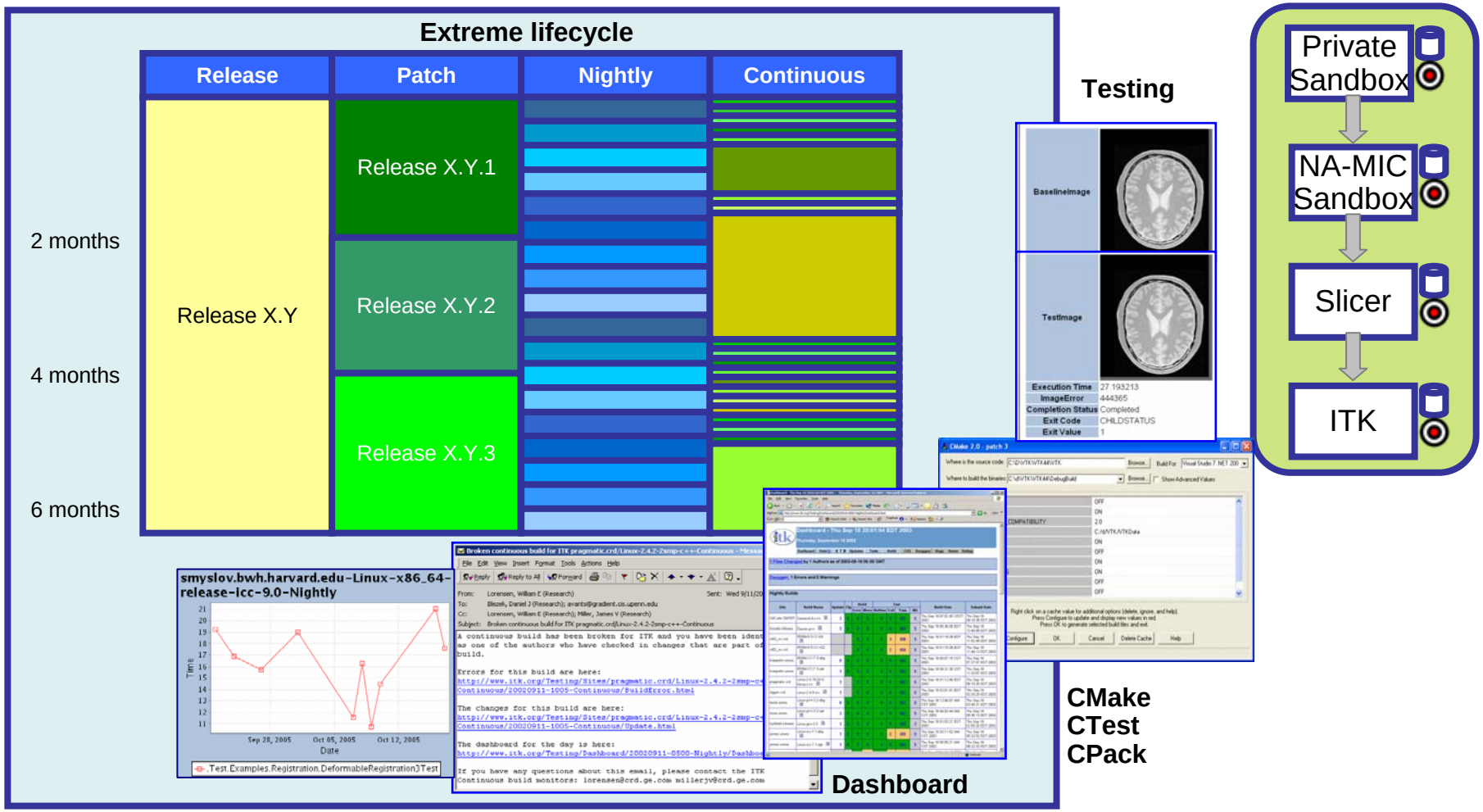
UCSD

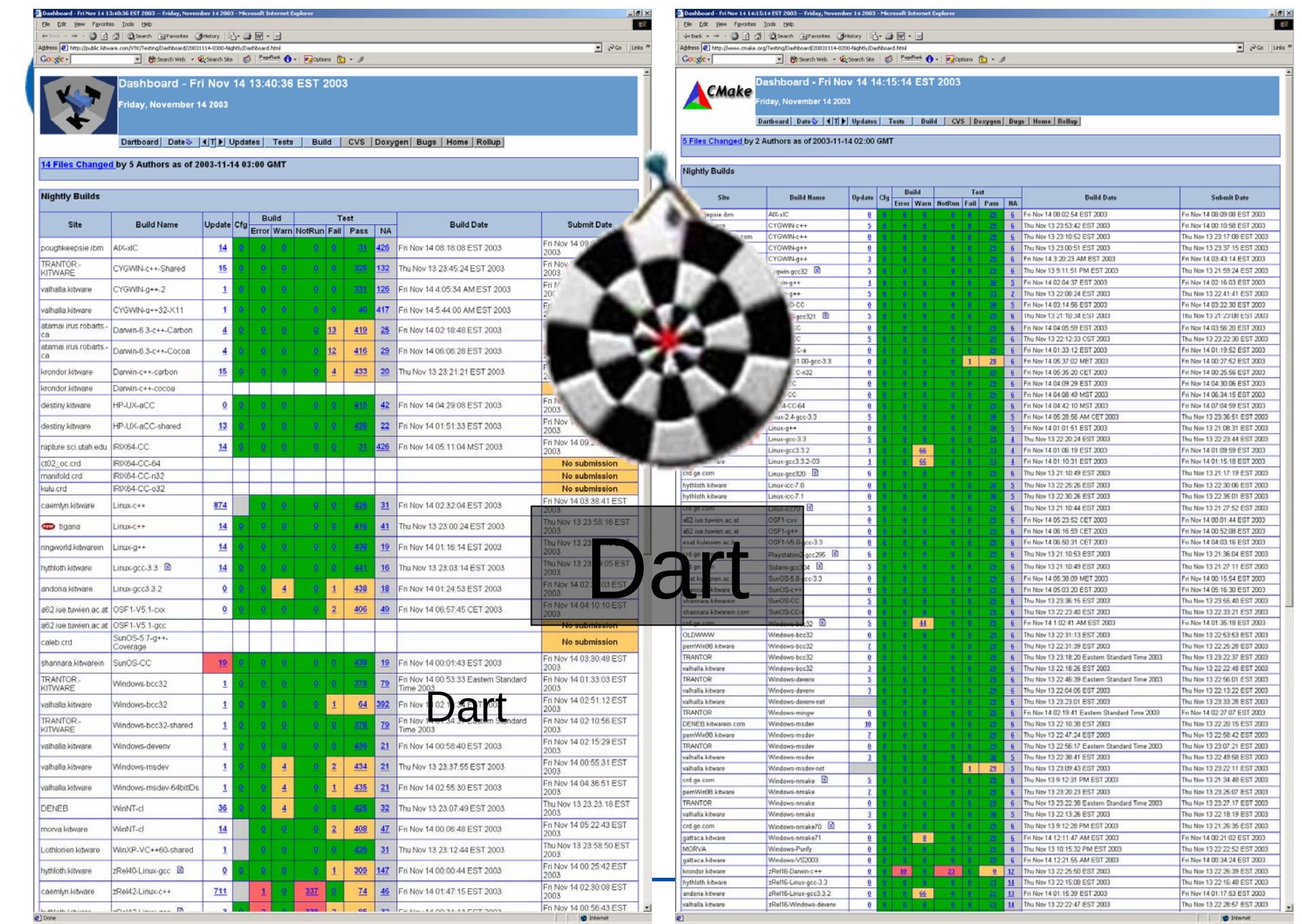

External Knowledge Sources
Mediator
Integrated View Definitions
Wrapper
Wrapper
Data and Database Sources
Data Integration
Middleware
High Performance and Grid Computing
Distributed Data

NA-MIC Kit

Software Engineering Tools
CMake/CTest/DART

Development Methodology




Dashboard - Fri Nov 14 13:40:36 EST 2003
Friday, November 14 2003
Dashboard - Fri Nov 14 14:15:14 EST 2003
Friday, November 14 2003
CMake
Dart
Dart

NA-MIC Kit

Communications

Social Engineering

- Daily – e-mail, dashboards, wikis
- Weekly – telephone conferences
- Periodic – architecture reviews, workshops
- Semi-annual– Programmer/Project week
- Yearly – All Hands Meeting

	Monday (Star, Kiva)	Tuesday (Star, Kiva)	Wednesday (Grier A and B)	Thursday (Grier A and B)	Friday (Grier A and B)
Goal	**Set the stage, share each team's goals for the week, make sure programming environment is functional**	**Goal: Write code in small teams, start discussion of slicer 3.0**	**Work... Tour Boston**	**Mostly finish up programming goals for the week. Report One Highlight.**	**Tie loose ends. Wrap-up week.**
8:30-9am	Breakfast in the R&D Dining Room	Breakfast in the R&D Dining Room	Breakfast in Grier	Breakfast in Grier	Breakfast in Grier
9-10:30am	Mathematics of Diffusion Workshop in Star(optional)	Meet in Kiva for 15 minutes, and then continue work in teams.	Meet for 15 minutes, and then Slicer 3.0 continue in Grier A, and other teams continue in Grier B.	One "mid-week" highlight by each project team	TBD based on feedback on Thursday evening
10:30-11am	Coffee in the R&D Dining Room	Coffee in the R&D Dining Room	Coffee in Grier	Coffee in Grier	Coffee in Grier
11am-12pm	Mathematics of Diffusion Workshop in Star(optional)	Continue...	Continue...	Continue to work in teams.	Continue...
12-1pm	Welcome/Lunch in R&D Dining Room (Grimson, Kikinis)	Lunch in R&D Dining Room	Lunch Boxes in Grier	Go out for lunch	Wrap-up week (Lorensen, Kapur)
1-2:15pm	Programming Week Kickoff in Kiva(Lorensen, Kapur, Pieper, Schroeder). 1:50pm: On requirements gathering (Tuch). 2:05pm: Sample Training Document(Pujol) Training Presentation Documentation Template	Slicer 3.0 in Kiva for the afternoon. Other Project Teams continue in Star for the afternoon.	Take a break to tour Boston (optional)	Continue ...	
2:15-3:30pm	Core 1 Projects Overview by Team Leads (10 min each)	Continue...	Continue ...	Continue ...	
3:30-4pm	Coffee in the R&D Dining Room	Coffee in the R&D Dining Room	Coffee in Grier	Coffee in Grier	
4-5:30pm	Computer/Env Setup	Continue ...	Continue ...	Continue ...	
5:30-6pm	Wrap-up for Day in Kiva (Lorensen, Kapur)	Wrap-up for Day in Kiva (Lorensen, Kapur)	Continue ...	Wrap-up for Day in Grier and identify critical items for Friday morning (Lorensen, Kapur)	
6:30pm		Licensing Discussion over Dinner (Hosts:Ibanez, Kindlmann)			

Main Page

search

Search

navigation

- Main Page
- Cores and Projects
- Events
- Resources
- Editing Guide
- Recent changes
- Random page
- Annual Reports
- Publications
- What links here
- Related changes
- Upload File
- Special Pages

Welcome to the NA-MIC Wiki!

[edit]

Editing Guide

- Getting Started
- Edit Existing Page
- Text Formatting
- TOCs and Headers
- Links
- Add New Page/Link
- Uploading Documents and Images

Welcome! This system is meant to encourage quick and efficient communication among the participating investigators and the interested users. If you are interested in the BIG picture or need an introduction to our project please go to our main web page NA-MIC. To get an idea of the ongoing activities in this project, follow the links in the Navigation box on the left side of this page: Cores and Projects contains information about the activities in the individual NA-MIC cores as well as cross-NCBC activities, the Events pages contains information about upcoming and past NA-MIC events including teleconferences, and the Resources pages contain information about NA-MIC software.

Events

[edit]

A list of all our past and upcoming events.

NA-MIC Internal Collaborative Projects

[edit]

This is a list of projects being pursued in NA-MIC.

NA-MIC kit

[edit]

The NA-MIC Kit consists of all software that is being made available under the NA-MIC project.

Results from Programming Events

[edit]

These are the results from our programming events held in 2005 and 2006 so far.

Pages for Affiliated Research Teams and Organizations

[edit]

NIH Page

[edit]

- This page contains useful information provided by our NIH officers.

Morphometry BIRN Page (to Wiki pages)

[edit]

- This page contains information about the Morphometry Biomedical Informatics Research Network (to web pages) Project, a close NA-MIC collaboration.

Function BIRN Page (to Wiki pages)

[edit]

- This page contains information about the Function Biomedical Informatics Research Network (to web pages) Project, a close NA-MIC collaboration.

Mouse BIRN Wiki

[edit]

- This page contains information about the Mouse Biomedical Informatics Research Network (to web pages) Project, a BIRN testbed examining mouse models of neurodegenerative disease.

Neuroimage Analysis Center (to Wiki pages)

[edit]

- This page contains information about the Neuroimage Analysis Center (NAC) Project.

Dissemination and Training

- National and International Events
  - MIT, MGH, UNC, EPFL, NIH, UNM, UCSD…
- All Materials on Wiki
- Project Weeks
  - Full Week Each Summer
  - ½ Week at Winter AHM
- Workshops
  - MICCAI 2005, 2006
  - Others Planned

NA-MIC Kit

Legal Framework

NA-MIC Kit Governance

- Free, BSD style Open-Source
- Final Decision about Inclusion is with NA-MIC leadership
- Support Required (no “shoot and forget”)
- Technology Base for Research **and** Commercialization
  - Okay to build GPL or Closed SW ***on top of*** NA-MIC Kit
  - But no GPL or Closed SW ***in*** NA-MIC Kit
- NA-MIC Provides “Reference Standard Distribution”
  - Maintain Official Releases
  - Avoid Code Forking, Non-Free Code Creeping into Core
- No “Knowing” Addition of Patented Techniques into NA-MIC Kit
- Copyright to Substantive Works Remains with Creators
  - Available under NA-MIC Approved Licenses for Distribution with Kit
  - Insight Journal is Example of this Process

Why NA-MIC?

- NA-MIC Kit is Available Now
  - Ready-Made Infrastructure for Medical Image Computing Development
- NA-MIC Kit is Usable
  - Many Examples, Tutorials, Mailing Lists…
- NA-MIC Kit Is Not Perfect But Will Continue to Improve
  - Multi-Year NIH Effort and Community of Users

More Information

- Project Overview
- Day-to-Day Organization, Project Plans, Event Information, Reference Materials, etc, etc.

NA-MIC

Ron Kikinis, M.D.
Director, Surgical Planning Laboratory